From the Author

THE INDUCTION OF SLEEP AND INSENSIBILITY TO PAIN

BY THE

SELF-ADMINISTRATION OF ANÆSTHETICS

BY

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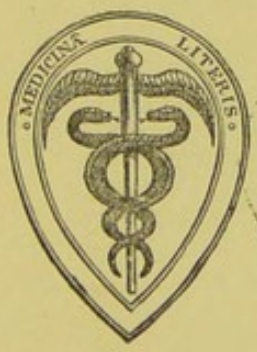

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"Ich grüsse dich, du einzige Phiole
Die ich mit Andacht nun herunterhole
In dir verehr' ich Menchenwitz und Kunst.
Du Inbegriff der holden Schlummersäfte
Du Auszug aller tödtlich feinen Kräfte
Erweise deinem Meister deine Gunst!"

GOETHE.

"Come sleep, O sleep, the certain note of Peace,
The baiting-place of Wit, the balm of Woe,
The poor man's Wealth, the prisoner's Release,
The indifferent judge between the High and Low."

SIR PHILIP SYDNEY.

THE

INDUCTION OF SLEEP

AND

INSENSIBILITY TO PAIN.

Among the agents that relieve pain and produce sleep the speediest and most effective are, beyond all doubt, the inhalent narcotics Chloroform and Ether. These two consequently respond the most bounteously to the heart-felt petition of those who are suffering much, and suffering acutely. The severity of the endurance is mitigated one-half by the simple arrival of means known with certainty to possess the power of quickly overcoming it. On the contrary, suspicion of insufficiency, or even of slow performance in any such administration, makes it, in the first instance at least, only a new trouble, contributing its increase of misery to the situation, and tending to conspire against its real utility.*

This consideration, then, naturally raises the question why Chloroform and Ether, thus holding the first place as remedies for acute suffering in virtue of the qualities

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* It is very far from my intention to in any way impugn the value of the old and excellent narcotics, opium, conium, belladonna, henbane, etc., or their newer allies, chlorodyne, cannabis indica, hydrate of chloral, etc., all of which, singly and in their various combinations, I have had ample facility for putting to the practical test of experience. It is willingly recognised that opium with its various derivatives is well worthy of being named, par excellence, "the gift of God to man," and that some of the others, as well as certain drugs that are not narcotics, are no less valuable in their own sphere. In consequence of this, there is scope for a wider practical basis to the science and art of the relief of pain and of euthanasia, than if its ministrations were confined to any single agent, however beneficent. The importance of such an art is best understood from the fact that there are certain stages of disease when active interference, aiming at a reversal of the physical necessity of dying, is to be regarded in the light of

specified, are all but neglected for such purposes except in one especial class of cases. Setting aside operations, surgical and obstetrical, it is very seldom that any occasion, be the suffering what it may, is recognised as an occasion for delivery by the speediest and most efficient means. This decision does not arise from any fallacious presumption regarding the inferiority in point of severity, of pain produced by disease to pain resulting from operation; for our sensibility in that direction is, and has always been, acknowledged to be as great as it possibly can be.* Yet, manifestly, pain ought to be remedied on the principle of its severity and urgency, not on the principle of its remote origin, whether from instruments or disease. The contrary practice is due to several causes: causes understood to be sufficiently influential to prevent the writer from anticipating the immediate reception of the more consistent and advantageous practice. Immemorial habit has associated the relief of suffering inflicted by disease with certain solids and liquids, and this itself must so thoroughly link many to the use of pills and mixtures that they never could break away to betake themselves to the employment of new, although superior, methods. But more than this, the administration of Chloroform has hitherto implied the personal superin-

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science and humanity alike as unpardonable; but that even then the plaint of the sufferer, expressed or unexpressed, is still, as in the language of Petrarcha:—

"Morte o mercè sia fini al mio dolore!"

It is a happy thing that there are provisions meet even for this sad state, and nobody can doubt that the more carefully they are investigated the more beneficial will be the result. It cannot therefore be thought, that it is with any scepticism in the value of such inquiries, worthy of far more attention than they have yet received, that I seek to advance the superior claims of chloroform as an agent for the relief of acute and severe pain. Being directly introduced into the circulation through the lungs, it rapidly yields the relief desired, and is susceptible accordingly of exact limitation to the necessity of the occasion, since its further inhalation can, and ought to be, immediately discontinued. It is very difficult, if indeed possible, to regulate with the same nicety any solid or liquid narcotic introduced in that form, and hence the greater liability to a superfluous dose, that is, a dose exceeding the necessity of the occasion. It must be observed, that although using the generic term *anæsthetic*, the remarks in the text mainly refer to chloroform, which far exceeds in every way any of the rest for the purposes here specially in view.

* Toothache, gastralgia, tic, nephralgia, gout, etc., may be as excruciating as any operation.

tendence of the physician, and that means, according to circumstances, loss, trouble, impossibility. The superior facility of prescribing is consequently a considerable offset against the comparative inactivity or inadequacy of the prescription. The object of my Self-Anæsthetic-Administrator is to reduce the use of chloroform or ether to the same level as regards facility, as opium or morphia; that is to say, to make it prescribable. This is possible, because with it the sufferer himself becomes the administrator, and any one who is a fit and proper subject for chloroform can therewith put himself to sleep with greater safety, and infinitely more comfort, than can be done by another, however skilful.* The obstacle, therefore, on the score of impracticability is removed. But there are yet other alleged impediments in the way of advancing those anæsthetic agents to their proper place as the chief remedies for severe pain. First, they are called dangerous agents; secondly, they are unsuitable in some cases; thirdly, undue familiarity with them would be physically and morally injurious. In the second part of my Essay I have endeavoured to show that the *danger* attaches not to the agent *per se*, any more than to any agent in human use, but to the administrator, or the way in which his ideas on the subject lead him to employ the agent. When the purity of the anæsthetic is ascertained with certainty, a matter of no difficulty whatever, the safety or otherwise of the administration depends upon:

(1) The Vital Condition of the Patient.
(2) The Method of Administration.
(3) The Degree of Anæsthesia Induced.

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* Just as feeding oneself may be called a natural arrangement in comparison with the conventional arrangement of being fed by another, so with this method for the administration of anæsthetics which puts the spoon, so to speak, into the hand alone capable of accommodating the supply to the involuntary processes that ultimately preside over its destination. The proceeding implies some intelligence to begin with, and the preservation of a modicum at least of that intelligence throughout the process; but very few are so hopelessly stupid as not to understand the simplest explanations, all that are here required, and chloroform in inducing sleep does not so disturb the mind in persons who will derive any benefit from its influence as to render them incapable of directing the necessary movements until sleep arrives. This subject is further pursued in the second part of this Essay.

It is enough to remark here that chloroform, although in its potential aspect a terribly dangerous agent, just as gunpowder is, when restricted by appropriate arrangements to specific effects, becomes not only harmless, but is instrumental to the highest good. As in every relation of mankind to the forces and materials of Nature, it is not the force or material *per se* that preserves or destroys, but always as it is directed and applied. The most powerful agencies, whether natural or artificial, are, in consequence of the attainable magnitude of their effects, the most valuable and essential to the life of the world; and Nature is as likely to suspend her chemical and electric laws to save us from the possibility of thunderstorms and volcanos, or the fear of them, as man to abandon the useful giants of his own creation, because a misadventure may sometimes, fairly or unfairly, be attributed to them. Chloroform, because it is the most powerful giant among the anæsthetics, is the most valuable, and it is just as feasible that the moon should get to be our work-a-day luminary because of its mild feebleness in comparison with the sun, as that chloroform will ever be shaken from its throne of benign usefulness to make way for any substitute aspiring in virtue of its inferior weakness. The purport of these remarks is not unduly to magnify chloroform over the other recognised anæsthetics, since the method which it is my principal object to explain is applicable to all of them that are fluid; but as much as possible to emphasize the fact that the strength of chloroform, were it even greater than it is, is not the quality in it which we have to fear. The paramount consideration is the way in which it must be handled, a consideration that might seem too obvious to require mention, since it is tacitly assumed in regard to every agent in use, were it not that it has been called in question at present by those who are personally ignorant of the properties of chloroform, and equally ignorant of its history, and are yet not restrained by their ignorance from asserting that they cannot be other than most pernicious. The law of progress determines that, until the discovery of a still more powerful anæsthetic, we shall endeavour in this department, as in every

other, to make our strongest giant our most useful servant.

As regards inadaptation to certain individuals, this must be admitted once for all, and that not in consequence of advanced diseased conditions, but certain special peculiarities which it is not always possible to estimate beforehand. As Pindar remarks of music, so it may be said of chloroform, those who are not soothed by it are perplexed, disturbed, irritated, the perplexity, disturbance, and irritation in this case being considerably more demonstrative than that so exceptionally excited by the concord of sweet sounds. Such persons are not suitable subjects for chloroform, however they may be for any other form of narcotic. But their disqualification is no plea for disinheriting others who are not similarly constituted.

The argument against the introduction of chloroform as a narcotic for clinical use as well as for operative measures, on the ground of familiarity leading to abuse, is one which it hardly concerns us to notice. It is no wish of the writer to see the reign of Nepenthe needlessly extended, for he is ready to admit the evil consequences of too great indulgence in narcotics of any kind, as any one must be who at all considers the physiological and psychological results, immediate and remote, of such practice. But the question of abuse ought not to be allowed a hearing when the question under discussion relates only to the matter of use. Whoever considers what pain is when it overrules every effort of human fortitude, and extinguishes the capacity for every experience but its own, will not be slow to recognise that the agent of mercy in those circumstances must be endowed with properties that are soon-speeding and powerful. For such extremities, not infrequent in the progress of disease, the best remedy is chloroform when its exhibition is not contra-indicated by the existence of unfavourable conditions. It is worth observing, too, that many persons who entreat to have chloroform, when they are so circumstanced, entertain a great repugnance to it when free from pain. How far this is the general experience I am not prepared to say, but it is at all events not exceptional.

The apparatus I have devised for the self-administration of anæsthetics permits the patient to put himself asleep, while a dangerous overdose is impossible, in consequence of the principle on which the supply of the anæsthetic depends. An india-rubber air-ball, communicating through a tube with the air inside the chloroform bottle, when compressed by the patient's hand causes the expulsion of two or three minims of chloroform through another tube dipping into it. This is received into a conical inhaler placed conveniently for inhalation by the patient. The compression of the ball being at the will of the patient, without which no chloroform can possibly reach him, so is the anæsthetic condition of atmosphere which he inhales; and as a single compression makes only a feeble alteration, the patient can accommodate this chloroform atmosphere to his capacity for respiring it, a condition of paramount importance to its agreeable and safe inhalation. All that is requisite is simply to provoke sleep, that is, to produce the tendency to sleep; and when this has been effected, there is a strong instinctive inclination to cease all movements, which the patient is naturally not disposed to resist, and consequently discontinues the further compression of the ball. Besides this, there is a physical impossibility of taking too much, because the voluntary muscles become paralysed, that is, incapable of any movement when sleep begins to supervene; and as a matter of course, no more chloroform can be inhaled by this method of administration.* When all the conditions favouring sleep are observed, that is, when the patient is in bed, comfortably warm and excluded from noise and too much light, and wearily longing for sleep, even although suffering great pain, an incredibly small quantity of chloroform is sufficient to produce it. For the simple induction of insensibility to pain a still less quantity is requisite, although repetition may sooner be necessary.† The use and safety of the

* When there is any apprehension of danger, only a very small quantity may be put into the bottle.

† It must be a very familiar experience to find how the simple attitude of bodily repose, when maintained for a short time, not only relieves but fre-

instrument will be further explained in the following rules and instructions which are intended to accompany each :—

"Unconsciousness to the extent of *sleep,* as distinguished from *coma,* is all that can be produced by this method for the self-administration of anæsthetics.* This is all that is necessary for relief from pain, however severe; it is all that can be reached and sustained with safety. The sleep thus induced, just as sleep when it occurs spontaneously, does not imply the total suspension of all susceptibility to impressions, but is that degree of unconsciousness in which the susceptibility is so diminished, that what otherwise would be acute suffering or violent pain, can at most be felt only as a feeble or momentary experience, and consequently does not awaken the sleeper at the time, nor recur to his recollection afterwards. *Coma,* on the other hand, is an entire suspension of all susceptibility to impressions—a condition bordering on death.

It is possible to attain *sleep,* and impossible to produce *coma* by this method, for the following reason:—*the inhalation of the vapour ceases whenever the patient begins to sleep,* and this because it is dependent on certain movements of the hand, which are arrested by the approach of sleep.

The anæsthetic sleep is dangerous, like natural sleep, in advanced diseases of the heart, lungs, or brain. Persons suffering from such diseases are always in danger, when asleep, of sleep passing into coma and death, and if they had recourse to anæsthetics would increase that tendency. But with those exceptions, sleep induced by chloroform or ether is not attended with danger.

The bottle is to be filled with the anæsthetic, the stopper screwed tightly down, and the point of the delivery-tube

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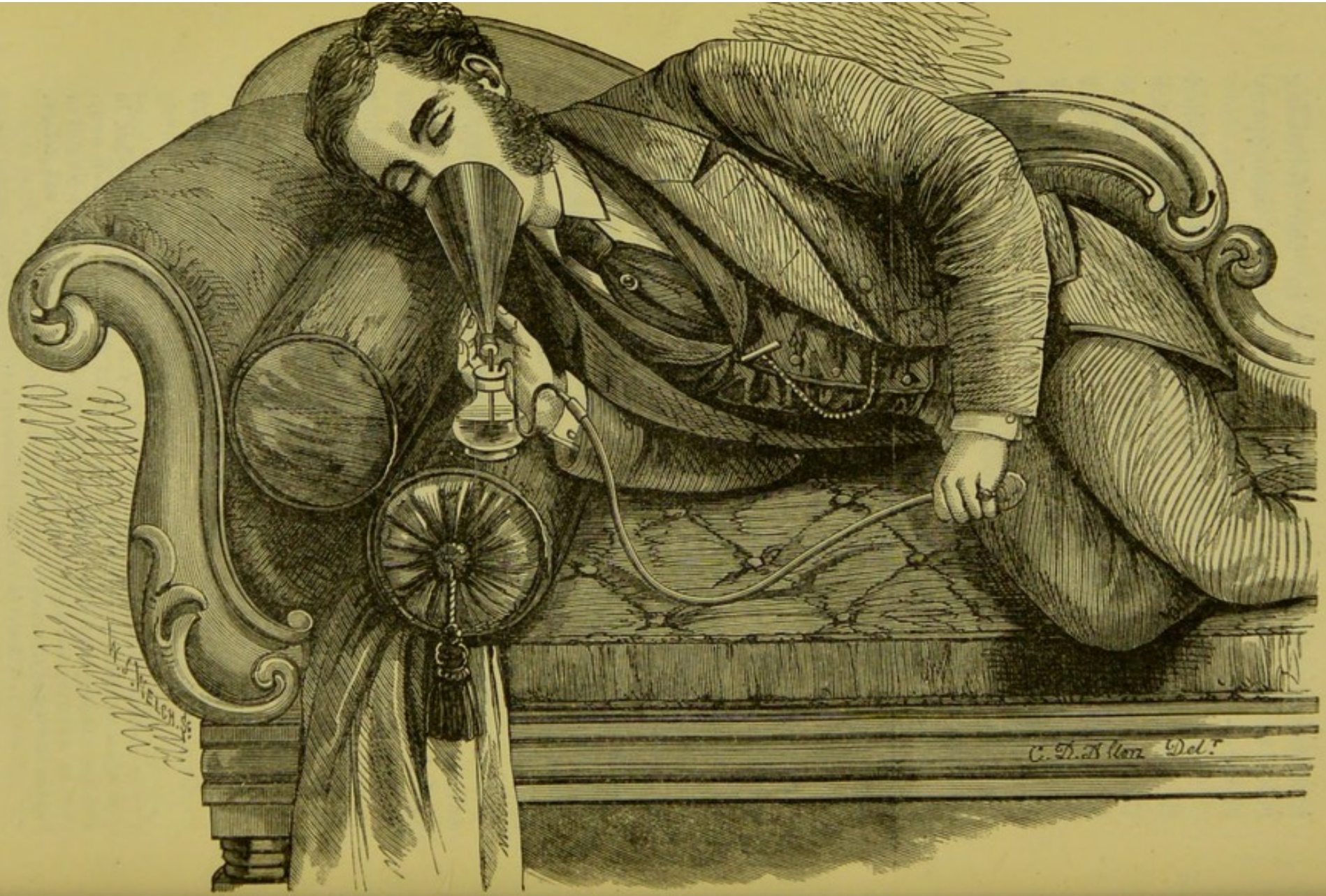
quently removes very acute pain. The stoic can hold out *suis viribus,* in determined tranquillity until he feels the tumult of throbbing ebb and die away. The more feeble need some material assistance to enable them to lie still in such an attitude, although when it is attained, the same result will follow. Rest is the remedy, and only needs to be made possible.

* Chloroform, ether, bichloride of methylene.



SEE THE "PRACTITIONER" FOR APRIL, 1873.

fixed in the inhaler.* A piece of blotting-paper or a small quantity of cotton wool in front of the delivery-tube inside the inhaler prevents the anæsthetic from reaching the patient directly. The inhaler is placed over the mouth and nostrils about two or three inches distant from them, and at each compression of the ball three or four minims are ejected into it. Two or three compressions per minute suffice to maintain the air inhaled, especially with chloroform, sufficiently charged; but the rate of compression is to be guided by the capacity of the patient for respiring the vapour, always taking care that the mouth and nostrils are so placed as to inspire what is being pumped into the inhaler, and, conversely, that none of the anæsthetic is to be pumped out while the mouth and nostrils are turned from the inhaler.

Perfect quietness must be enjoined on attendants, if any, and patients should compose themselves as in preparing for sleep ordinarily, so as to assist the action of the anæsthetic, and must not be interfered with during the process.

When sleep supervenes, the ball of the instrument is let go, just as the plaything drops from the hand of the sleeping child.

The safety of the instrument for use as directed depends entirely on the accuracy of the mechanical adjustments, and therefore none will be sold but those examined and approved by the Inventor." †

Besides extending the clinical use of chloroform, the instrument will be found useful when the agent has to be exhibited at obstetrical operations, when it is exceedingly difficult and harassing for one person, as in the country is often necessarily the case, to attend to the operation and superintend the administration at the same time. At surgical operations, also, it may be used with advantage,

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* When the small opening in the air-tube is covered by the slide, the maximum quantity of anæsthetic is ejected; when it is left free, the minimum.

† Messrs. S. Maw, Son, and Thompson are the sole authorized manufacturers.

if not by the patient, by the administrator, as it supplies a means of slowly increasing the chloroform atmosphere as the patient gets used to it, and afterwards of maintaining it of the same quality; the quantity of chloroform pumped into the inhaler, which of course does not need to be removed, being always as nearly as possible the same and subject to exact regulation.

PART II.

The dread of chloroform as a narcotic is just in regard to the *administrator,* unjust in regard to the *agent.* Chloroform allays pain or promotes sleep, but it also overwhelms consciousness in stupor and coma, and inevitably conducts to death precisely according to the extent it is introduced into the system. Herein it only resembles every humanly utilizable agent, which passes from the production of good to evil, just as it is directed.

With the administrator rests the grave responsibility of the result, who, in every case, needs to be assured, in the first place, of the purity of the agent on the one hand, and of the vital condition of his patient on the other. Chloroform being a definite chemical compound, and consequently invariably answering in the same manner to the same chemical tests, which are easily applicable, its wilful adulteration would be too hazardous to be profitable, and its accidental impurities are readily detected by the manufacturers themselves, several of whom exercise great care in this particular. Under such circumstances it is obvious the article itself may always be obtained and proved as thoroughly trustworthy as any definite and invariable product can be.

The vital condition of the patient is ascertainable with an equally high degree of certainty in regard to the circumstances that would determine a fatal result under anæsthesia. The pre-existence of really critical conditions is not veiled by any impenetrable mask, and though the origin and advance of fatal lesions may be rapid, yet not

so rapid that the patient, who is sound at the commencement of the anæsthetic process, should succumb through an intercurrent malady before he again returns to consciousness. Sudden death in such circumstances may be attributed to incognizable or incidental causes, but the conviction with most minds will always be that the verdict is a poor apology for ignorance, or a bold excuse for culpability.

Diminished respiratory, cardiac, or cerebral power to the extent of imperilling life on the inhalation of chloroform, is declared by very unmistakeable characters. The patient is seriously disabled in the execution of ordinary *movements,* and is deprived of the capacity for *sleep* in its normal continuance and degree. The registration of impeded movements, voluntary and involuntary, the inevitable consequence of organic disease, is carried out by the automatic machinery of the system with great accuracy and legibility. When it attains a high pathological significance it is difficult to imagine how it can be overlooked, and it is to be borne in mind that it is only when it does so that a positive signal is raised against the employment of chloroform. Were the minor stages of disease in important organs also disqualifying conditions, the legitimate range for anæsthesia would be very circumscribed indeed. But the measure of vitality, revealed by careful inspection and computation of the strength of the functions, is much reduced when it is imperative, on those strictly intelligible grounds, to interdict the administration. It is quite another question when the safety of administration has been satisfactorily ascertained, in what manner and to what extent it is to be proceeded with. The chemical purity of the agent, and the vital condition of the patient, are the preliminary investigations, the *method* and *degree* of anæsthesia require to be authorized in the same way by rational and definite principles.

As concerns the *method,* our object being to produce sleep, it is essential to follow the regulations of Nature, conducive to that result, bearing in mind that the anæsthetic sleep is not sleep upon new principles, nor sleep invoked by the operation of a different machinery from that which yields it

on other occasions. Now, it has always been recognised that the external conditions favouring the advent of sleep are provisions for *rest, quiet, shade.* The principle is simply the withdrawal of the senses from their natural stimuli, leaving the attention awake only to reflection which, as a less powerful and less varied stimulant than sensation tends, according to the law of relativity, to become inoperative, and so consciousness falls more or less into abeyance. The physiological condition favouring the advent of sleep is that degree of exhaustion which enfeebles the functions without causing pain, and changes the quality of the blood within certain limits. The part played by anæsthetics in inducing sleep is that of effecting the last-named condition, viz., an alteration in the quality of the blood. Now, it is very certain that in comparison with all the other conditions, this is the Triton among the minnows. Sleep must come whether it be wooed or not by other inviting circumstances, and not only so, but in spite of every opposing circumstance, if this spell is exercised with persistence. Here is the giant with the giant's strength; but to use it like a giant is most miserable. I cannot comprehend the notions of a sane man, nor enter into his feelings, when he proceeds to compel sleep with a high hand, in utter disregard and contempt of all the arrangements auxiliary to the end in view, and careless of provoking the most hostile conditions, simply because in chloroform or ether he has an agent that can most effectually counterbalance the absence of all assistance, or the presence of any opposition. If there is any occasion when the golden rule of medicine and surgery ought to come out higher in relief than ordinary, it is over the patient about to become the subject of anæsthesia. *Arte non Vi.* The principle enjoining the minimum quantity of any narcotic takes rank as an axiom in rational Therapeutics, and must strike even the uninitiated understanding as a self-evident point of prudence. It is only a corollary from this that every condition favouring the occurrence of insensibility or sleep be provided for, and every condition antagonistic to it be withdrawn within the limits of possibility, when an anæsthetic is to be administered, so that the quantity required

may be the smallest the case admits of. To borrow a phrase from mechanics, the resistance is the mental excitement of the patient, the power is the anæsthetic agent. The greater the degree of excitement, the greater the anæsthetic power necessary to overcome it. Reduce the excitement of the patient to a minimum, the least possible amount of the narcotic only has then to be administered. I freely admit the difficulty of *preparing a patient for sleep* according to the terms mentioned on many occasions before giving chloroform at operations. Rest and quietness, not to go further, are not always compatible with the surroundings, and there is oftener than otherwise no means of procuring healthy exhaustion and its concomitant conditions. But when unfortunately no antecedent measures are practicable to allay excitement, it is surely most indisputable that every precaution should be taken to avoid producing it as the administration proceeds. Here, indeed, we come upon a point of cardinal importance, not only affecting the fulfilment in regard to chloroform of the first law of narcotism, as I think the principle advocated may not unfairly be named; but touching the very foundation on which chloroform and ether, and their similars rest their claims, to be considered anæsthetics at all. It is a mischievous thing when avoidable excitement requires to be drowned in superfluous narcotism, and is to be denounced when the contest ends far short of the fatal point toward which it eternally gravitates. But mark, besides that effect, such excitement under the circumstances means *pain*, and if, as nobody conversant with the physiological properties of chloroform will deny, excitement may be carried to the highest pitch within the compass of man's nature under its influence, we have to guard against converting an agent only justifiable on the ground that it relieves pain, into an agent unparalleled in the severity of its inflictions. When the administration of chloroform or ether is productive of pain, who can say that an anæsthetic is being administered?

Dependent on those obvious truths, one of the grandest errors that it is possible to conceive practicable in the method of employing chloroform or any other existing

anæsthetic is that of beginning by compelling the patient at once to respire a highly charged anæsthetic atmosphere, and of continuing by entirely ignoring every indication he manifests for a momentary respite from the process. Such treatment inevitably unsettles every effort at mental or bodily composure and very soon becomes the cause of unmitigated suffering. It is, therefore, a complete and merciless annihilation of the whole spirit and purpose of anæsthesia as well as a proceeding fraught with the most imminent danger to the life of the patient.

The chief end and aim of this benign agency always is to lessen or annul the sufferings of those who otherwise must suffer beyond the common endurance, and however it may aid the purposes of the surgeon in other desirable ways, would lack all sanction if it failed in fulfilling that great object. But it does not simply fail thus far, when stringent disregard of the patient's entreaties for moderation is enforced; it is made, in every such instance, an instrument of infliction, that in the relative significance of degrees of suffering must be expressed, not as pain, but as agony. The patient has in truth to go through the horrors of impending suffocation, as any one will find who chooses to submit to the ordeal. Yet the instrument of the surgeon in operation on the most sensitive tissues of the body, or the severest pangs of disease, do not rise to the incomparable severity, and cannot produce the terrible effects on the mind that threatened or impending suffocation does, for life is then in the most desperate of all situations, and most palpably so to its possessor, who feels with the full force of all the vitality that is in him, as if the mortal struggle were approaching with the irresistible certainty of fate. Hence the violent efforts that are made to escape from the predicament, efforts that are as deaf to reason as the winds or waves, and sometimes as difficult to control as those of a fury might be supposed to be. Yet what a strange interpretation of this phenomenon to call such conduct irrational; on the contrary, no being endowed with life and the power of movement, however meagre of intellect, can act irrationally on the spur of such encounters. It is the

last charter of existence to fight for breath, hence every remnant of energy is pressed into the contest. The administrator is responsible for bringing matters to such a pass; and although he may succeed in spite of all hazards in overpowering the senses of his patient and rendering him insensible to the pain of the coming operation, it is done by such a process as presents the most striking example of killing for kindness that perhaps the world has ever discovered.

The total exclusion of oxygen from the lungs for two or three seconds, whether caused by occlusion of the trachea as in strangulation, or by the inhalation of a non-oxygenated atmosphere, produces nearly the same physical condition, and entirely the same mental experience, the feeling, namely, of instant suffocation; no air being as insupportable as air and no oxygen. Chloroform or ether, but especially the former when inhaled without an accompanying sufficiency of pure air, immediately originates this terrible sensation, and it is not surprising that the feeling should be most intense at the outset. The passage from one condition of atmosphere to another, if rapid, even when the change is very slight, is keenly appreciated by the lungs; and no wonder, therefore, that a change so great as that from pure air to chloroform vapour should excite great disturbance and alarm, especially to persons totally ignorant of what is going to follow. The sudden recoil of a person who puts his nose to the mouth of a bottle exhaling strong ammonia vapour is considered very natural, and yet a highly concentrated dose of chloroform vapour is about as irritating and as suffocating. These simple facts, however, are certainly lost sight of when the chloroform is held on to the patient in large quantities, and the struggling indicative of its effects accepted as a matter of no moment and beneath notice. The explanation, apparent though it is, cannot be suspected, or there would be no room for the preposterous belief that all the movements of persons undergoing anæsthesia are simple extravagances as wild and worthless of regard as the tossings and turnings of a feather in the wind. As soon as a patient inhales the first whiff of

chloroform, this doctrine teaches that he is no longer to be considered a rational, far less a reasonable being; but every utterance that escapes him, every effort that he makes, is to be treated as a mere hysterical ebullition, indicative of no human thought or purpose, so that those almost unmanageable wrestlings and strugglings often witnessed nearly at the first approach of chloroform are thought as natural to some persons as the extraordinary performances of the new dancing jack under the potent influences of steam. And even when the fact of choking or suffocation is recognised, its significance as an infliction on the patient is strangely underestimated or not estimated at all. Looking to the heaven of relief before him, little or nothing is thought of the purgatorium through which he is to be borne; and hence the rule still is, as before, to push on with the administration of the anæsthetic, regardless of any outbursts of opposition; notwithstanding what such outbursts may mean. Anything fuller of meaning than a terrible struggle to escape from such a position is simply impossible to imagine. True, there may be no real cause for alarm, that is, just as a man whose mouth and nostrils are held tight until he gets blue in the face, may rally and resume the thread of existence without any patent bodily detriment, when relief comes just at the proper moment, so also this experience of suffocation from chloroform or ether may be only a momentary one, in hands too scientifically perfect ever to allow its becoming an accomplished reality.

If, therefore, the patient could be but as calm as the operator, and by some overmastering grasp of his involuntary impulses keep instinctive movements in check, even the mental endurance might not exceed that of a horrible nightmare. Now, strange though it may seem to many, this is actually said to be quite possible, much to the credit of human nature for fortitude. Dr. Jeffries, of Boston, who visited London in the summer of 1872, for the purpose of educating English surgeons in the art of anæsthesia, affirms that, in regard to ether, if the patient be informed beforehand that he is going to be "choked," in many instances he bears it heroically, and then goes to sleep quietly. C'est magnifique,

mais ce n'est pas anæsthesia. We had thought such iron steadfastness of will died with the Roman youth. Surely, however, such patients must be very exceptional people, and considering their voluntary powers of endurance might very well go through any surgical operation without aid from anæsthesia. Anæsthesia at such a price becomes hyperæsthesia, in the interest not of pleasure but of pain. It is not, however, in every instance, as will very readily be believed, that the patient forewarned of the fact, and resolved to accept it, can preserve his heroic intention to be choked quietly when it comes to the push, and for them Dr. Jeffries has the following rule, to which special attention is invited as it enjoins the very reverse of what ought to be practised: an antithesis alike to humanity and common sense. "When the patient, whether old or young, struggles and asks for a respite and fresh air, *do not yield. Hold them down by main force;* and, at any rate, keep the sponge tight over their mouth and nose till they finally take long breaths, and then soon go off into ether sleep."* How until "soon?" But even with "soon" added, and were it in place, heaven shield us from such ether sleep! To be held down by main force is sufficiently uncomfortable usage in itself, but to be held down by main force and choked with ether at the same time, looks like Herod and Nero coming upon us at once. But, seriously, what a contradiction, not in terms but of grim realities, does such a spectacle as that here supposed sanctionable by the latest discoveries of science present to any humane and thoughtful mind!

> "For this hath Science searched on weary wing
> By sea and shore each mute and living thing?"

Here is a person who, submitting willingly to a certain process, but suddenly finding it insupportable, struggles with the energy of despair, so that he requires to be kept down like a madman by main force for a certain period of time, in order that he may escape the pain of an operation, that could not possibly be more severe, and might not probably

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* *British Medical Journal*, Nov. 2nd, 1872.

be more prolonged. It is a sight, in good sooth, that might well make the angels weep and break the heart of generosity. Such a palpable mockery is beyond patience and cannot, I think, be too severely ridiculed. Self-evident it must be, that if anæsthetics, even if innocent in all other respects, must necessarily be productive of as much misery, not to say more, than they are capable of alleviating, it must be high time to give them the go-by. In the comparison of painful experiences nothing equals that of suffocation, and consequently any patient who has to be choked in the first instance, if he can make up his mind to it, had much better use his fortitude against the far less serious infliction of the knife, and for those—to be supposed much the greater number—who would shrink at the thought of having their heads held longer under water or into ether than was just bearable, we should advise them by all means to elect "to be held down by main force" for the operation of the surgeon rather than for that of the etherist or chloroformist. Here, I have expressed myself freely and without reserve, because I feel that it will require more than any amount of quasi-scientific glamour and humdrum technicalities to persuade any man of ordinary common sense that "main force" and "choking" are mere trivialities when enforced secundum artem. *Res ipsa loquitur.*

But more than the passing struggle with suffocation, "the main force practice" is eminently dangerous to the life of the patient. If terror alone is a sufficient cause of death, as is generally believed, could death from it conceivably occur in more likely circumstances than when a person feels impending suffocation and every movement of his body is manacled as in a vice "by main force?" Sudden death might very easily result from the mere mental state of a person so environed by restraint and choking vapour. And when we consider the purely physical agencies operating at the moment in the same direction—irritation of the lungs directly, and of the heart through the nervous system—tending to produce asphyxia in the one case and syncope in the other, death under such treatment has no

plea to rank among the mysteries, at all events for want of "sufficient causes." Yet it does not take the tenth part of a moment to make an effort in avoidance of a source of irritation in breathing, and consequently were the individual permitted to follow the instinctive promptings of nature, such effort might be enough to save him when nothing else could. Chained and fettered, on the other hand, moving only at such times and in such degrees as the will of another determines, it is only too natural that such an unnatural arrangement should terminate sometimes in the fatal catastrophe of death. So much then for what is diametrically opposed to the purpose of anæsthesia, and most manifestly hazardous to the life of the patient.

In the happy reverse of all this, the attainment of the noble aims of anæsthesia, insensibility to pain with safety and without discomfort, by the use of existing anæsthetics, and especially of chloroform, requires a more natural method of administration, and a more enlightened construction of the psychology of narcosis. I do not know that it is a very prevalent opinion that a person of ordinary intelligence must be regarded in the light of a lunatic from the moment that he begins to inspire chloroform; but it is undoubtedly too much the habit to deny the patient from the first all but a very scant measure of intelligence under the impression that the anæsthetic must very soon derange all that, even when there is a fair proportion to begin with. The anæsthetic of itself does no such thing, although unfortunately it may easily be made to do so, and mainly by injudicious methods of administration, partaking in some degree of the "main force system," which has been so strongly condemned. The process of falling asleep under chloroform is not essentially different from the usual process when disturbing causes are not interfering, and takes place without any derangement of intellect, beyond that transient flickering of disjointed ideas immediately preceding sleep, the same as naturally. To this I can testify from my own experience, and I am assured by others that theirs is similar. In corroboration also, the perfect tranquillity with which I have seen many patients go to sleep under its influence

when the process of administration was left entirely to their own management indicates the absence of all mental derangement. It has been forgotten in estimating the mental effects of anæsthetics how very stupid many people are when they begin to get drowsy naturally, and how slow they are in recovering their senses when first aroused from sleep. Our notions on the subject also have chiefly been drawn from the case of persons about to undergo operation; on whose minds, for weeks or months, painful apprehensions have been preying, and whom an observant nurse often finds battling with their fears, like Richard with his ghosts, even within the curtain of sleep. It demands all their waking vivacity to chase away the tormenting thought; so when they begin to sleep it becomes predominant, and need not therefore surprise us, when on the eve of fulfilment it sometimes breaks out amid the gathering dreaminess of realities in exclamations: "bind up my wounds," or in sounds less articulate. The newness of the situation too, the presence of a cloud of witnesses, and other circumstances must go for a good deal in rendering sleep before an operation, under any condition, somewhat less placid than ordinarily. But more than any or all of these I believe the terra incognita that lies before the patient in the chloroform sleep itself is the cause of wakefulness and distraction on the route towards it. To tread new paths into so mysterious a region calls up many strange forebodings in human minds, ever apprehensive of evil on the side of the unknown, and, with fearful fancy on the alert, it must be confessed the initiatory train of sensations, especially if there be anything like "main force" in attendance, may not be reassuring. The subject for chloroform is not, as a rule, the philosophic Cato, with a bosom void of fear, calmly soliloquizing on the brink of the great Unknown itself: "Through what new scenes and changes must we pass;" but much rather the startled Juliet, overborne by the certain calamity of coming events, and yet shrinking from the means of escape because of its many vividly conceived mischances. I wish to give some prominence to this point

because some people seem to think the patient should take chloroform with as much composure as they are prepared to give it; but this is hardly possible unless pains be taken to inspire confidence. The mental struggle naturally arising out of the circumstances is plainly depicted by the countenance as well as by the remarks of many before giving themselves up to this slumber-compelling vapour, and it is very manifest that the arguments in word and manner of a skilful administrator are most powerful in allaying their fears. But more than this, some intimation of the usual experience met with during the process of administration is much calculated to remove apprehension, where we have any intelligence to work on at all, as it is the most certain method for defeating or keeping surprisal in check. Of course where there is no intelligence, premonition is out of the question, but there it is not really wanted, as it is the existence at least of some intelligence that creates apprehension. And even if present only in a minor degree it is too valuable a property in this as in any other instance to be ignored. Forewarned forearmed, although there is really nothing in the usual experience to occasion any alarm. On the contrary, the inhalation of chloroform, when properly directed, is from first to last a most agreeable, not to say delightful experience.

The first effects are the sensations arising from the action of the vapour on the nose, mouth, and lungs. The olfactory sensations are pungent only when the vapour is supplied in too great strength, in which case the eyes suffer as usual, whether they are closed or not; otherwise, chloroform has a pleasant odour, not comparable to anything else, but distinctly of the sweet rather than the aromatic class. The sense of smell, however, is soon exhausted, for in less than a minute, if the inhalation is continuous, the vapour loses its power of affecting the organ. In some persons, in fact, it is only the first whiff that produces any smell at all, so that if one were to breathe the vapour from a narrow-mouthed bottle, when it would pass through the nostrils only, they might forget the fact that they were inhaling it until

reminded by distinct symptoms of excitement or drowsiness. Hence the danger of such a proceeding if the supply were unlimited, but, under suitable direction, there can be little doubt the *nostrils,* in consequence of the agreeable feeling first developed, and their subsequent insensibility, are the most appropriate channel for the inhalation. For, as the vapour passes through the *mouth,* although being sweet, it is sufficiently agreeable at first to those partial to that kind of taste, yet ultimately it degenerates and produces a tendency to the accumulation of saliva, the peculiar characteristic of nauseating tastes. This, indeed, is the only disagreeable event occurring throughout the ordinary experience in going to sleep under chloroform, but it amounts to very little in reality, being overcome by the inducement of other feelings of a powerfully agreeable character as the administration proceeds, and would be much overrated if judged of by itself, as our exposition requires it to be noticed. It may be avoided, however, if necessary, by learning to inhale through the nostrils.

The respiratory sensations are extremely pleasurable, when of course no touch of stifling, far less of choking, is permitted to supervene, to in any degree threaten discomfort or danger. Vapours of this kind are to the lungs what vinous and alcoholic beverages in stimulant proportions are to the stomach, and introduced with a due proportion of fresh air are directly exhilarating, and give an impetus to the natural play of the organ. This is the essential element of human pleasure throughout. It particularly needs to be noticed, however, that the air ought to be fresh air; for air deprived of this physiological quality, even although pure in its chemical composition, lacks an important element in contributing to this sense of pleasure. Good whisky makes good punch only when the water is good, and this remark is quite as apposite, if not more so, to the admixture of air and chloroform. Hence, one of the objections to Clover's apparatus, where the air in which the chloroform vapour is suspended, is distinctly impregnated with that disagreeable *closeness* which is peculiar to air confined for any time, or even passing through or over certain organic

textures, and this even when not more seriously deteriorated by the products of respiration—water and carbonic acid, which tend to accumulate within the mouth-piece of the apparatus referred to. The air of the common fire-bellows, for instance, has a very different whiff from the fresh air from which it is drawn, simply from being in contact with musty leather for a moment or two. When the chloroform, therefore, evaporates from a handkerchief or any surface permitting an immediate mixture with the external air, it is much to be preferred to confined air both in point of pleasure and of wholesomeness. In order, however, that the respiratory sensation may be agreeable, the most important condition is that the patient be allowed to inhale the anæsthetic atmosphere according to his capacity for its influence, instead of having it forced upon him according to abstract principles, or what is infinitely worse, no principles at all. The law of the œsophagus determines that each individual shall be the best judge—perhaps the only reliable judge—of how he shall swallow his food, and the law of the trachea no less vigorously demands that the man himself shall be the one person to regulate his respiration when such regulation is necessary. It is very necessary, as already remarked, on so great a transition as that from pure air to ether, or an atmosphere of air and chloroform. The adaptation of the lungs to any new atmosphere is always, except under compulsion, guided, in the first instance, by an intelligent instinct, as much so as the determination of the bolus that can be swallowed, and the rate as to how they shall succeed each other.* In one sense the inhalation of new gases or vapours touches the comfort and safety of the individual, much more directly and acutely than the introduction of food into the stomach. Their subtlety for mischief, in fact, is as much greater in degree than incautious spoonfuls

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* Waiters are a comforting order of men when they place a good dinner before us, but their further assistance as administrators thereof would be very disagreeable. An impatient waiter, for instance, with liberal ideas of swallowing might soon create some uneasiness to his ward, and if he were regardless of entreaties, and had unlimited confidence in the virtue of "main force" it would not take very long to bring matters to a pretty pass indeed.

of food, as respiration is a more delicate function than deglutition, while the lungs are guarded against the influx of solids and liquids, but not against vapours.

With all respect to those who believe in "a generally respirable admixture of chloroform and air," that is, such a mixture as can be inspired by any one, it is impossible to believe that the specific capacity of individuals can be thus subordinated with comfort, however it may be with safety, to any fixed combination. It much concerns the most gratifying results that the peculiarities of individuals be carefully attended to, and when it is not possible to allow all the ease and freedom that self-administration implies, there ought most undoubtedly to be a clear understanding that the administrator is to follow the expressed requirements of his subject, and not on any account to erect himself into a divinity, presiding with autocratic authority over the delicate susceptibilities and necessities of another man's respiration. If these simple rules are observed, the sensations arising from the parts immediately affected by the inhalation of chloroform, as well as the subsequent feelings due to its further influence on the system, will be found, to say the least, not disagreeable. Of those more remote effects, it is enough to say that being simply the result, like the sensations, of an increased activity of the faculties, they are in like manner pleasurable. They are of course of the nature of excitement, but being rapidly induced, and rapidly subsiding again in sleep, it requires no great effort, during their transit, for the mind to retain its ordinary equanimity, as far as outward expression goes, although there are no doubt light-headed mortals who never having learnt to know what self-control means, are not likely to learn it for the first time under the influence of chloroform, and consequently are apt freely to expatiate on their unusual flow of thoughts and feelings.

But although it is true that a highly nervous subject, liable to be upset by the least disturbance, may find it difficult to control the exuberance of their feelings during the transient stage of excitement, even they will profit by having been previously informed that this is a

thing to be, as it is undeniably enjoyable, enjoyed without any misgiving, and that all they have to do is to think of going to sleep. Beings of a firmer order of mind will meet the exalted sensations and ideas with corresponding tranquillity when it has been explained to them that this is simply the result of an increased activity of their faculties such as they have perhaps before felt when they may have had more than one glass of wine. Whoever can take kindly to those sensations in serenity and confidence is a proper subject for chloroform, when it is required, and will very soon go to sleep, enjoying even the pleasing sensation of sinking into slumber. But those, on the other hand, who will do their utmost to keep awake, who strive with all their might and main to drive sleep far from them, and surrender their consciousness as if it were their life, are persons very precarious to deal with, and have obtained a very doubtful advantage when their consciousness, and not their life, have finally been put under. The fact that many persons do try to keep awake through fear, as long as they can, is notorious, and this is mainly the consequence of their having no idea how they ought to behave themselves. They have in fact to be taken every inch by storm, instead of freely surrendering themselves to an ally and a friend. The consequence of such opposition is the certainty of an overdose of the narcotic, and even when not fatal this must in the very nature of things be highly injurious. But it may even be fatal, for it ought to be taken in here that the patient inhaling chloroform comes to feel precisely the same sense of heaviness as the man who has exhausted the power of his muscles by a hard day's work, and inclination goes then just as in the latter case, if it be not opposed, harmoniously with the surrender of what capacity remains; that is, inclination seeks rest and sleep. But in either case, and as much in the one as in the other, by an effort of the will, stimulated from within or without, this sense of heaviness, representing actual exhaustion, can be overcome, and voluntary movements performed, and the struggle can be kept up indefinitely; but the consequence is, that when additional labour or additional chloroform has finally drained

every remnant of energy, and sleep at last triumphs, it is not sleep in the ordinary sense, but something much more profound, perhaps stupor or coma. It has occurred for men so to exhaust the vital powers in voluntary movements as suddenly to drop down and expire; and oftener, perhaps, to exhaust them to such a degree that, when they did lie down to sleep, it was, not to rise again. The excessive pain attendant on such efforts is a sufficient safeguard in all but very exceptional circumstances, and it might be thought rare to find any one so perversely opposed to give in to the influence of chloroform as to succumb through such resistance; but yet it is very far from impossible, considering what fear is equal to, and it always represents a dangerous tendency, and strongly inculcates the rule of not allowing any one to go to sleep under chloroform with their vital forces seriously exhausted, as well as admonishes the patient to give way to the first promptings of sleep. The curious notion that *the necessity of breathing* is what prevents our natural slumbers from passing on to the deep sleep of total insensibility and death is a seriously fallacious one in connexion with this subject. The necessity of breathing can do no more for us in keeping up life when the vital powers are exhausted, than the necessity of meeting his creditors can sustain a man's honour when his funds and credit are exhausted. It is a very nice balancing of Nature's, when she sends us so far into the realms of unconsciousness as in natural sleep and no further; but this is not effected by the appointment of any special guardian to watch over our slumbers. It is not, so to speak, an *in somno* arrangement at all, but an *ante somnum* arrangement, dependent as it is on a certain degree of exhaustion, and, therefore, in great measure amenable to the will of the individual during his waking hours.

In concluding our observations on the *method* of administering anæsthetics it ought to be noticed that the patient should always be comfortably warm before the process is commenced. Cold, as is well known, is antagonistic to sleep, and therefore the cold patient is more difficultly

got over, while the degree of congestion that it implies renders the exhibition of the anæsthetic correspondingly dangerous. In recommending attention to all the conditions favouring sleep naturally: quietness, rest, shade; in denouncing measures calculated to cause excitement and fear; in advising some preliminary explanation to remove misunderstanding and inspire confidence; and in insisting on relieving the patient from restraint and allowing him to take in the vapour as he feels able, I think I am only humbly appealing to principles of common sense, which is nevertheless the *fons et origo* of the best and highest Science.

To determine on the *degree* of unconsciousness necessary for the extinction of pain demands as careful consideration as any of the points already discussed. In the case of self-administration Nature manages her own business, taking what is necessary for inducing sleep, and therewith desisting. But at the hands of another, and during a severe operation, the preservation of the happy medium—insensibility to pain with safety—is a matter of much nicety. Consequently, when the administration is of the bold and heroic type, prompted by daring without discretion, suffering is likely to be extinguished, but the risk is in proportion. On the other hand, when the administration is of the pusillanimous order, the sufferer is deprived of his much-needed antidote, and the great remedy descends into the merest sham, not half so respectable as mesmerism. Instances of both kinds are only too numerous at hospitals, as well as in private, and of the latter perhaps even more than the former. Each has its own theory, like every other practice, whether we allow it or not, only the theory, unfortunately, does not always need to be a scientific theory. So in regard to the very fearful, as well as the very fearless, type of administrators, their guiding theories can hardly be called scientific. Thus I have heard a gentleman maintain before a scientific meeting that there were persons to whom a single whiff of chloroform would be fatal, and that when death did occur from chloroform it was usually the first whiff that did it.

This statement, to quote the expression of a well-known character, is "Prodigious!" but it discloses the state of mind in which some persons assume the office of administrators. It appears, according to them, that the interpretation of the singular occurrence is all to be found in the charming word "idiosyncrasy," which, like its *confrère, lusus naturæ,* has been invented by philosophers, as Dean Swift says, to the unspeakable advancement of human knowledge. Practically, however, there must be fear and quaking enough to mar all when exaggerated and baseless notions such as these come halting in the way, professing to do something, but far more suspicious lest they do something else. If, indeed, the patient escape without increase of suffering this is all he can expect from the mock administration of chloroform. For our own part, we are disposed to think that to be so near death and not know it as to die from a whiff of chloroform, to have so arrived at the utmost limit of a mortality inscrutable alike to consciousness and science, very closely resembles the fate over which Cæsar used to sigh: *Sibi et suis euthanasiam similem.* At the same time it ought to be distinctly understood, that to die from a whiff of chloroform is just as feasible as to die from swallowing a bread pill, or "of a rose in aromatic pain." There is no evidence of such a thing ever having occurred, and it is quite certain that a whiff of chloroform might be inhaled by any one, even in the most advanced stages of organic disease, without hastening in any appreciable degree the period of life. The opinion, on the contrary, that mostly favours recklessness has a more scientific air about it, but is equally erroneous with the last. The mistaken conception, originating with Bichat, of a physiology of animal functions, and a physiology of organic or vegetative functions as two fundamentally distinct and separable departments in the general physiology of man and animals, has led to the belief with some that our life may be bisected into the divisions animal and organic, so that the animal functions may be wholly suspended without any detriment to, or diminution of, activity in the organic functions. The error has undergone much modification since it

was first put forth by the French physiologist, whose mode of representation was fanciful, although extremely crude and eccentric. "It may be said that the vegetable is the outline, the canvas of the animal, and that to form the latter it is only necessary to clothe this canvas with an apparatus of external organs." * A man would thus be a vegetable plus a nervous system, senses and muscles, and might be reduced again at any time to the state of a vegetable by the suspension of the action of those superadded parts. Dr. Carpenter says that the distinction between animal and organic functions, although a fundamental distinction in physiology, has seldom been given accurately, and is one on which much confusion prevails. If it be a fundamental distinction, all that can be said is that physiologists get on pretty well without much attention to their fundamental principles; and it must be confessed also that Dr. Carpenter has not done much to clear up the confusion. The usual method of dealing with the subject in books of human physiology, is first to draw the distinction with great precision, marking off so many functions as belonging to the vegetative, and so many to the animal system, and then to directly cancel the distinction by explaining that they are all bound up together, animal and organic, in inseparable connexion. The natural inference is, therefore, that the separation is fictitious and the connexion real. The fact is the terms may be adopted by the anatomist, although even he might without much difficulty find more suitable ones, but they are altogether inadmissible in physiology, for the physiology of the human body, unlike its anatomy, admits only of an ideal partition; in reality it is one and indivisible. The language of everyday life recognises in a rough way the principle which anatomy carries out to the extreme limits of scientific investigation. Thus we speak of the head, arms, legs, skin, &c., as constituent members or elements of the body, and therefore parts into which it may be divided; and anatomy does no more in its minutest researches than endeavour to discover how far this mechanical division of organs and

* Bichat, "Sur la Vie et la Mort," p. 4, s. 1.

structures may be carried. Here it will be observed, therefore, that the principle or axiom that forms the basis of anatomical science—the divisibility, namely, of the body into separate and distinct parts, has the sanction of universal consent, as expressed in language everywhere adopted, and familiar to all mankind.* The resolution of the life of the body, on the other hand, into two or more lives, an animal life and a vegetative life, or a greater number of fragmentary and independent lives of equal or varying degrees of importance to the aggregate, has manifestly never been taken up in the same way, for there is nowhere discoverable in the common current of human thought the least attempt to break up this unity into sections. Rather, if we consult the common belief and the general practice consequent thereon, we shall find that mankind have always been most positive as to the singleness and indivisibility of what they recognise in themselves as life. Now there can be no stronger *à priori* objection to any special doctrines of science than that they are not only not countenanced by any vestige of common approval, but are face to face at the very outset, and in the directest manner, with the most deeply rooted persuasions of the race, for it can be very easily demonstrated, as in the case of anatomy, that all the fundamental positions of science, without exception, that are genuine, and on which the greatest and most useful structures have been raised, were held primarily, and are always maintained as standing points in the philosophy of the vulgar. As much might be inferred from the mode of the formation of our knowledge; but independently of that, we have this induction from facts to which as yet there has been no proved exception.† This

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* "Das Studium der systematischen Anatomie muss dem Studium der topographischen vorangehen: die systematische Anatomie setzt ihrer seits weider eine Kenntniss der Regionen voraus, die wir glücklicher weise zum grossen Theil shon aus dem gewönlichen Leben mitbringen."—*Henle.*

† See A. Comte, "La Philosophie Positive," vol. i. p. 796; also Whewell's "History of the Inductive Sciences."—Of course if the exception were proved, our *à priori* objection would necessarily fall to the ground; but that this distinction is not only artificial but arbitrary is obvious from the fact, that it is not now founded on any intelligible principle. Bichat proceeded on the principle that whatever

dissection of physiology therefore into animal and organic functions, without going more minutely into the question, may be safely set aside as erroneous, and with this explanation it will be more easy to understand the danger of the practice founded on it in regard to anæsthesia. If the administrator conceives it possible to realize this analysis, he proceeds freely to narcotize the patient until all signs of voluntary movement and consciousness (animal life) are paralysed, believing that the movements of the heart and lungs (organic life) continue with as much vigour and certainty as before. Now the truth is, the facts as they occur in nature point to the very opposite conclusion: that is, when a man is no longer sensible to any feeling or capable of executing any movement, the vital activity of the heart and lungs are on the point of failing, and for ever. There is a constant and direct relation, as the most familiar facts show, between the rapidity of cardiac pulsation, of respiration, and of mental and bodily activity. Thinking and running just as they increase in vigour, make the heart and lungs go also with increased speed, and as those diminish so do these. In sleep, it has been asserted that there is a temporary arrest of all consciousness and voluntary movement, and that involuntary movement continues just as before; but this is a grave mistake.*

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functions in man were not organic were animal; but this, although apparently logical enough, did not enable him to decide where to place "reproduction," which for various reasons he could not make up his mind to include in either class. It is the usual plan now to call reproduction an organic function, while respiration is regarded as the doubtful or epicene function; but why, it is impossible to say. A. Comte, in his celebrated work, following Blainville, argues that consciousness is the criterion, those functions being organic whose operation is not attended by consciousness, and those animal whose operation is attended by consciousness. If this be not the distinction, he says there is none. There is, however, no such distinction, there being no function in the body whose operation does not involve consciousness. For a systematic exposition of the so-called organic sensations, the reader is referred to Professor Bain's work on "The Senses and Intellect."

* "Die Ruhe des Organismus ist nur sheinbar, und selbst die Werkzeuge des animalischen Lebens, Muskeln, empfindende Nerven und Denkorgan, äussern eine ununterbrockene, wenn gleich ausser der Reizung schwache Thätigkeit, whelche Theils bei genauerer Beobdachtung direct wahrgenommen, Theils auf Umwegen erschlossen werden kann." S. 110; Henle, *Handbuch der rationellen Pathologie*

More accurate observation shows that here also it is simply a matter of degree in which both kinds of movements are alike diminished only. "The unconscious cerebration" of Dr. Carpenter is a way of expressing the subauditer of ideas and emotions that haunt the sleeping brain, and the still lingering tonicity of the muscles during sleep proves their capacity for movement, as in an irregular way they are actually seen to move. I have narcotized dogs and other animals with chloroform and other agents until within an ace of extinguishing life, but I have never been able to satisfy myself that their sensibility even at this juncture was beyond stimulation, although the response to the most exquisitely painful stimulants was certainly extremely feeble. I once saw, at a case of ovariotomy, the operating surgeon turn angrily to the chloroformist and order the administration of more chloroform, because when he began his long incision through the skin of the abdomen, the patient winced and wriggled a little. The order was obeyed, but with reluctance, the propriety of which was justified in less than two minutes, when the chloroform had to be discontinued in consequence of symptoms of asphyxia, and the operation terminated without re-exhibiting any more of the anæsthetic. Enough has perhaps therefore been said to show that an attempt at the complete and total extinction of sensibility is a very dangerous attempt, since when one is totally insensible to the most violent stimulants they are very near indeed to the confines of nonentity. There is no need, however, on any grounds, for carrying insensibility to such a pitch. All that humanity calls for is the reduction of suffering to such a degree that it shall not seriously affect the patient at the time, and consequently shall not retain any hold on the memory when it is past. It is possible to annul the pain of a continued and severe surgical operation by maintaining a state of unconsciousness very little more profound, if any, than that of natural sleep; the proof of which is *the easy and speedy return to ordinary consciousness,* when the administration is suspended; and yet the patient, on recovery, has scarcely any idea of

what he has gone through, and will hardly believe that the operation is over, notwithstanding certain manifest indications of sensibility during its progress.* This is what I venture to call the *beau idéal* of anæsthesia, as it is at present practicable, with existing anæsthetics. "Est quadam prodire tenus; non datur ultra." It is no victory to extinguish every remnant of mental existence, even apart from the consideration of danger, if the return to the ordinary state from such profundity of narcotism must be through days and nights of sickness, prostration, and lingering lassitude; as, on the other hand, without a certain degree of sleep through narcotism, the sufferings of the operating theatre and of severe diseases cannot at present be effectually relieved, nor are there any solid grounds for entertaining the belief that insensibility to pain only, while all the other capacities of the mind remain intact, is a possible attainment of any future anæsthetic. Brown-Séquard thinks he has discovered eleven different sets of nerves, each of which is "absolutely distinct one from the other, as regards their special functions," and among these, one set, is conductors of impressions of pain.† Even were this a fact, and it requires a great stretch of imagination to get as far as that supposition after a diligent consideration of the arguments advanced on behalf of it, to paralyse those conductors of painful impressions without affecting any of the other sets, with all of which they still would be puzzlingly interwoven, would be a difficulty hardly to be overcome. It must not be thought that there is

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* Such movements are usually known by the name of "reflex;" but, although independent of the will, it is a mistake to suppose that they are entirely divorced from consciousness.

† "Lectures on the Diagnosis and Treatment of Functional Nervous Affections," 1868, p. 10.—It is said that a certain Alphonso of Arragon dared to think the fabric of the heavens might have been constructed on a simpler plan when the orrery was exhibited to him,

> "With centric and eccentric scribbled o'er,
> Cycle and epicycle, orb in orb."

Much of the doctrine regarding the nervous system at the present day, like the astronomy of the Middle Ages, is sufficiently involved to make one heartily sympathize with Alphonso.

any pretence made, in the works of the celebrated physiologist referred to, in favour of such a consummation; but the disciple sometimes takes the lead of his master by a good long way, and there is an idea afloat among certain optimists that an anæsthetic is discoverable capable of entirely annihilating the sense of pain without in any degree touching the other senses. Well, what the future may do with new and superior agents will be disclosed by the future; the present seems mostly to have to guard against the fallacy of supposing that the newest compound must be the most perfect. The relevancy of the discussion, however, lies in the fact that with our present anæsthetics the sense of pain is the first to succumb, although not without involving other mental capacities in its train, under their influence. This is by far too important a fact to let pass unnoticed, much more when in danger of being distorted by misleading opinions that in some degree resemble it. The order of subsidence of the faculties under chloroform is most manifestly as follows: 1st. Consciousness of pain; 2nd. Voluntary movement; 3rd. Intellectual consciousness; 4th. Reflex or automatic movement. The proofs in behalf of this position are most conclusive, consisting of all the ascertained facts on the subject. But it is not to be understood that those functions disappear one after the other in the order named, like so many gas-jets turned off in succession; in which case we should always cease our administration when the first was screwed out, and allow the others to burn as brightly as before. The actual process is more analogous to the advance of the tide over four reefs of unequal height situated at the same sea level. When the lowest is submerged (consciousness to pain) all the others have descended in the water to a corresponding degree, but are still discernible in their proportional order of magnitude. In other words, by a merciful arrangement of nature, the first attribute of mental existence that is neutralized by the approach of unconsciousness, whether it be through the advent of sleep naturally or artificially induced, or of death, is the sense of pain: but this is attended by a diminution in the strength of

all the other faculties and functions, mental and bodily.* When the patient begins to lose the regular command of his voluntary muscles we may be certain, as is generally assumed, that his sensibility to pain is gone. Yet up to this point and beyond intellectual consciousness, a certain perception of his situation and surroundings still remains, so that he can conceive to do what he cannot do as at other times—a fact as old and as well known as alcohol. But effort of any kind is too troublesome under the circumstances to be continued, and therefore sleep naturally and speedily supervenes.

A full statement of the proofs in support of the order of paralysis as explained cannot be entered into here, but it may be remarked among things familiar to any one at all acquainted with the subject that patients may sometimes be got to execute certain movements, although with apparent difficulty, immediately before an operation is commenced, by the pain of which they are not at all affected. More frequently can they recall remarks made at a time when their insensibility to pain has led to the belief that they are equally insensible to sound.†

The practical result of such knowledge is to restrict the administration of anæsthetics within the limits of perfect safety, since pain can be successfully extinguished without leading the patient up to the gates of death. That anæsthetics may yet be discovered that shall effect the elimination of pain with greater nicety is a very reasonable expectation. In the meantime it behoves us to make the best use of those we have, since they have already done so much and can be made to do so much more for the alleviation of human suffering.

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* Goldsmith has devoted an eloquent chapter to this subject in his "Vicar of Wakefield."

† A patient was asked, when under the influence of ether, to hold up her hand, which she did just as the operation was commenced for removal of the mammæ, and yet gave no sign of suffering nor complained of having felt any afterwards.

DR. CROMBIE'S ABSORBENT PAPER,

AS PREPARED BY

MESSRS. BURGOYNE, BURBIDGE & Co.

THE special advantages of this preparation as a dressing for suppurating wounds and ulcers of all kinds are the following:—

1st. It sucks up from the discharging surface the thin acrid secretion which, by destroying the surrounding tissues, is the active agent in enlarging the wound when it is allowed to remain for any time in contact with the parts. Ordinary lint is a very imperfect absorbent, and hence keeps the discharge in contact with the surface instead of removing it.

2nd. It is a very clean and inexpensive dressing.

3rd. It can be employed in any degree of tenuity, and consequently is much lighter on the surface of sensitive sores than lint of any description.

4th. It can always be removed from the wound without breaking-down granulations or causing bleeding or pain, because it has little tendency to adhere, and when adhesion does take place it is easily overcome by simply soaking the paper with a little water.

*The paper generally requires to be slightly wetted in water before application.**

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* See *Medical Times and Gazette*, Feb. 8, 1873.