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DE RATIONELE VERKLARING VAN HET ONTSTAAN EN WEZEN DER LONGTERING, EN VAN DE WIJZE DEZE TE VOORKOMEN. Vrij uit het Engelsch Vertaald, door L. F. Praeger.

CONSUMPTION,

AS ENGENDERED BY

REBREATHED AIR AND CONSEQUENT ARREST OF THE UNCONSUMED CARBONACEOUS WASTE,

ITS PREVENTION AND POSSIBLE CURE.

BY

HENRY MAC CORMAC, M.D.

Κτημα ες αει.

SECOND EDITION, ENLARGED AND REVISED.

LONDON:
LONGMAN, GREEN, LONGMAN, ROBERTS, & GREEN.

1865.

ADAIR, PRINTER.

DEDICATION.

TO WILLIAM MAC CORMAC, ESQ. A.M. M.D. F.R.C.S.I.

To you, my Son, I inscribe this volume. In common with myself you belong to a profession which, as a profession, is incorruptible pure, a ceaseless providence for good in behalf of suffering man.

As generations disappear in the abysses of the past, the things which shall subsist here after us are not merely our mouldering frames, but deeds of love and goodness, conquests from the mighty realms of matter and mind. For these, these are the real remains, remains that do not perish, memories that cannot die.

If my doctrines, as set forth in this volume, be true they must almost infinitely subserve the great interests of our kind, establish means most sure most certain for arresting the ravages of decline. They would extend yet farther the merciful mission of the medical man, confer indeed on all men the power of conforming yet more closely to those divine provisions which imply that health, not unnatural decay, soundness not rottenness, should prove the portion of us all. And, yet, these doctrines, I contend, are certain as that light speeds or that the tidal wave follows the course of sun and moon.

I thank you earnestly for your sympathy and assistance throughout the prosecution of my inquiries, and subscribe myself, my Son, your deeply attached Friend and Father.

THE AUTHOR.

PREFACE TO THE FIRST EDITION.

CONSUMPTION and Scrofula, in every essential, are one. Tubercle, in its varied protean guises, is but the result of the bloods deterioration, of the retention of carbonaceous, hydrogenous, and other impurities, where they have no business to remain. In consequence of the imperfect performance of the respiratory act, these impurities accumulate in the tainted blood. The time at length comes round when they must be got rid of, if not by and during the act of respiration, perforce otherwise. The result, then, is their deposit in the guise of what is termed tubercle, in the lungs and other organs. A dead unorganised matter is thus laid down in the living tissues. That which should be thrust aside, cast out, is detained within the organism. These all important facts being positively determined, the inference necessarily follows that consumption and scrofula, with all their concomitant ravages, are thereby placed, as absolutely as smallpox itself has been placed, within human control. There need then, I assert, be no more consumption, no more scrofula, and diseases which have actually advanced as civilisation itself has advanced, may henceforth be set aside.

PREFACE TO THE SECOND EDITION.

JUST ten years have elapsed since the first edition of this work, years which have only served to justify my convictions and fortify my views. The volume has been revised, an introduction in fact a new work has been added, while eight several memorials addressed to as many different societies in the interim, are subjoined.

If I had a stentors voice, an angels pen, I should employ them to enlarge on views which, with my very firmest convictions, I believe to embody the safety and material healing of our kind. They pervade, indeed, with one unswerving aim the ten different essays of which the volume is composed.

It is only by a vast induction of facts that we can ever hope to arrive at the knowledge of a great general law. Now, this volume, in respect of the formation of tubercle, supplies those facts, presents this induction, establishes I submit that law.

Consumption and scrofula alone accrue when the same unchanged air, any of it, is habitually rebreathed. And when the same unchanged air, any of it, is not habitually rebreathed, consumption and scrofula are simply impossible. The whole book, from the first page to the last, is a comment on the following text. Do not breathe the same air again and you cannot incur tubercle, breathe the same air again and you cannot in the long run avoid tubercle. In fine, by avoiding rebreathed air, tubercle and tubercle induced maladies may be superseded now, and suppressed for ever.

THE AUTHOR.

BELFAST, *April* 1865.

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Malgre le traitement le plus rationel et le mieux derigé, la phthisie n'en restera pas moins une maladie contre laquelle viendra souvent se briser tout l'art des plus habiles praticiens. Les médecins doivent donc appliquer toutes leurs facultés à trouver les moyens de la prévenir. Il-y-a là un immense service à rendre à l' humanité, et une ample moisson de gloire à recueillir. Roche, Dict. de Méd. et de Chir. Prat. Tome xiii. p. 65.

INTRODUCTION.

To injure or deface needlessly or wantonly, as ensues in the production of tubercle and tubercle induced disease, any portion of Gods most excellent creation is plainly to run counter to his divinest will. Consumption, as it is the most needless, is also the greatest because most frequent and fatal of all inflictions. It is the very opprobrium of medical art.* Who says Beddoes† is unaware that consumption forms a portion of the history of innumerable families. And who, I shall add, does not know that remedies hitherto have been nugatory and preventive measures *nil*.

The sexes, *per se*, are liable equally. Actually, however, both in England and in France, there is a considerable preponderance of consumptive females over consumptive males. Relatively, at least in England, more males appear to die in towns, in the country more females. This is explained by the various indoor callings and pursuits exercised in towns by men, the indoor occupations of women in the country. About every fourth woman and fifth man we meet, in Europe, generally, labour more or less under some form or other of tubercle. It is the state of the indoor air, and very particularly the bedroom air, and not the condition of the outdoor atmosphere at all, that is to account for the production of the malady. A sufficiently renewed indoor atmosphere and particularly a sufficiently renewed bedroom atmosphere, together

* Duncan, *On Consumption*, Edinburgh, 1816, p. 2.

† *Essay*, London, 1799, p. 20.

with active and, particularly active outdoor habits, will render life wholesomer in general and freer from consumption, even in towns, than it will prove in the most admirably circumstanced country residence with ill aired rooms and passive inactive habits. For action, coupled with a pure atmosphere, tends to life and health, whereas inaction and an unrenewed rebreathed atmosphere but insure irreversible decay and death.

In Paris, Louis had in his hospital practice seventy cases of consumption in women, against fiftyseven in men. And even in persons dying of various chronic maladies, not otherwise tuberculous, there were twentyfive tuberculous women for fifteen tuberculous men. Chateauneuf also testifies to the great preponderance of phthisis among Parisian females. In England, taking the Registrar Generals returns, the mortality in phthisis is thirtynine women to thirtysix men. From inquiries made by direction of the Privy Council, it was ascertained that London printers and tailors who reached the age of fifty, died just twice as fast as did agriculturalists at a like period of life, while among London tailors the mortality was fiftyseven, and among London printers, both, at from thirtyfive to forty years of age, it was actually one hundred and seventeen, per cent above that of agriculturists who had attained to the same age. The best workshops, even, as Smith states, are crowded ill ventilated and most detrimental to health. It is not in many cases so much the actual unwholesomeness of certain trades, in themselves, as the abominable conditions under which they are prosecuted, that proves so hurtful. The mortality from phthisis, everywhere excessive, is in fact more than twice as great in towns as it is in the country. Thus, from certain statements recently laid before Parliament, it appears that for every hundred persons who die tuberculous in the country, two hundred and eighteen die tuberculous in Leeds and two hundred and sixtythree in Manchester. Agricultural labourers, the freest of any,* would be entirely free from phthisis but for the frightfully deficient sleeping accommodation. In the Crimea, subjected to every exposure, our soldiers were more exempt from phthisis, nay disease in general

* Neison, *Report.*

as Praeger writing to me from the Hague observed, than at home. The results are relatively bad in respect of all exclusive indoor callings. Of those who exercise them, at least five times as many labour under tubercle as is the case with those who lead active outdoor lives. Alas, everywhere evil habits and unwholesome requirements carry off our hapless species in countless numbers ere their time.

Tubercle, in other words the arrested because unburnt carbonaceous waste, is the substance and no other whose presence entails consumption and scrofula in every degree. It is the very essence and indoles of these maladies, their sufficient reason and sole material cause, for without tubercle there can be no scrofula, and without unburnt carbon there can be no tubercle. Tubercle in fact is no other that the arrested because unoxidised carbonaceous waste, in fine the detained metamorphic refuse of the living organism, detained by reason of imperfect defective respiratory function. This detained waste gathers in the blood, and when the blood can no longer hold it, for its powers in this respect are limited, it is laid down per force in the living tissues deranging their action and causing rottenness and decay.

Tubercle induces not merely scrofulous outbreaks and consumption proper, but also occasions eruptions about the ears and nose, otorrhoea, tarsal and general ophthalmia, cutaneous and subcutaneous deposits and structural changes, articular destruction, burrowing abscesses beneath the scapula loins limbs and abdominal integuments, the psoas and other muscles, tubercular lodgments in the hands feet, the bodies and cartilages of the vertebrae, the pelvis, the long bones and their extremities, the ribs and even the skull.* It does not follow, observes a recent writer,† that a deposit of tubercle must necessarily occur in every case of scrofula.‡ I can only say that without tubercular deposits there can be, there are, no

* Eruzione alle orecchie, al naso e alla testa, tumori bianchi articolari, pedartrocace, ascessi vasti alle scapole a' lombi ai psoas alle natiche e altrove, carie delle ossa del cranio, i corpi delle vertebre, la sostanza delle coste, i muscoli de moti voluntari. Bufalini, *Patologia Analitica*, Pesaro 1830, Tomo ii., p. 416, 424.

† Holmes, *System of Surgery*, Lond. 1860, Vol. I. p. 336. ‡ Id. p. 337.

scrofula and no consumption. They are simply names, speaking of essentials, of one and the same thing. Otherwise, if tubercle in the form of scrofula do not prove so immediately or invariably fatal as does tubercle in the form of phthisis, it is simply owing to the relatively lesser vital importance of the parts implicated, for the degeneration is the same.

Tubercle may remain long latent, but its usual tendency is to death.* In the brain, where the writer just named strangely states that it is most frequent, and cerebral membranes, to say nothing of the spinal marrow and its membranes, tubercle induces inflammation and effusion. White swelling, the *tumeur blanche* of the French, the *tumori bianchi* of the Italians, is no other than tubercular synovitis. When I was a pupil under Dupuytren at the Hotel Dieu in Paris, the house atmosphere then as now was simply infamous. What a locality, indeed, for the treatment of tubercular disease which there was to be witnessed under all its forms. Tubercle of the knee ankle foot hip spine shoulder elbow wrist hand skin and cellular tissue, tubercle of the lymphatic and other glands, tubercle of the larynx trachea and the various structures of the intestinal canal, in short tubercle and tubercle induced degeneration, multitudinous and multiform, met you in that vast retreat of human suffering and decay, at every turn. In the mornings, and indeed throughout the day, one could hear in different directions the cries of those who were undergoing the terrible infliction of the moxa, as the rolls of cotton, dipped in a solution of nitre then dried and set fire to over the affected part, were termed. As this truly infernal process went on, the foul incense of burning flesh polluted yet farther the sickly fetid atmosphere. The moxa, then, as since, applied in completest ignorance of the true nature of tubercle, did not of course heal the malady. The frequent and torturing amputations, because of tubercle, were likewise ineffectual, equally. The local ailment along with the part which it affected might be lopped away, but the more deeply seated infliction was not excised along with it.

When tubercle affects the lungs it rarely implicates them

* Le tubercule peut suivre une marche destructive, il peut aussi s'arreter et se terminer par une guérison plus ou moins complete. Lebert, *Pathologie.*

only.* Generally, probably always, other organs other structures share, more or less, the same calamitous infliction along with them. Mesenteric phthisis, to wit *tabes* of the mesentery, tubercular peritonitis from tuberculisation of the mesenteric glands, perhaps coupled with ulceration of Peyer and Brunners glands, is among the more insidious aspects under which tubercle saps and undermines the so perishable life of man. Although in the immense majority of instances it prove so, it is not invariably, as Laennec has stated, associated with tubercle of the lungs. In a *post mortem* examination of a young gentleman of eighteen, in whom the mesenteric glands peritoneum and intestines formed one dreadful mass of ulcerations adhesions and effusion, I failed after a careful search to discover a single lung tubercle. In two other cases of mesenteric phthisis, one in a little girl of ten, the other a youth of fifteen in whom serum and carroway seeds used to escape from the umbilicus, I have the impression of a similar immunity. Louis has recorded a like exception.† Why one organ should be implicated and not another, or many others, is what we cannot tell. Some unknown influence creates the difference.

The frightful instances of tubercular degeneration which medical men are called upon to witness, are often pitiable in the extreme. In a poor girl who had attained what ought to have proved the very prime of glorious womanhood, the lungs were mere sinks of decay and rottenness. Her father a servingman, her brother a working mechanic, the mother a washerwoman, and a sister who did the housekeeping and marketing, all occupied along with the subject of my notice, a needlewoman, one small bedchamber without a fireplace, and with a window that had never been moved until I forced it open with my own hands. I lavished on her, but vainly lavished, my utmost skill and care. On the third or fourth time of calling, this withered white lily asked her father to raise her in bed. Father, dear father, she faintly said, then

*Il est rare que le poumon seul contienne des tubercules. Laennec, *Auscultation Médiate*, 4 ième Ed.

† *Recherches Anatomico Pathologiques sur la Phthisie*, p. 179.

with one last fond look expired. The good father himself soon after perished, and the whole family, I have little doubt, were more or less tuberculous.

Tabes of the mesentery, though so commonly fatal, may haply end in cure. The diversity that subsists is otherwise very great. One person eaten up so to speak with tubercle may yet survive for years, while another shall incur speedy death as when tubercles one or more find their way into some contiguous serous cavity. In certain organs tubercles may be numerous in others few,* while oftentimes they are found to subsist in organs where at first their presence was perhaps entirely unsuspected. A French writer on surgical pathology relates that the amputations in a certain hospital having proved unusually unsuccessful, a practitioner more wisely inquisitive than his fellows, had the bones of the excised limbs examined and thereby ascertained that they were crammed with tubercle. Amputation, apart, tubercle of the bones heals rarely. Anchylosis however in certain joints contiguous to the deceased bone is just possible, and is dwelt upon by Brodie and other surgical observers accordingly.† Unhappily, the moxas setons issues blisters and actual cautery of the surgeon, prove just as inoperative as do the liniments ointments digitalis and tartar emetic, the chlorine and iodine inhalations, the medicated and other baths, the fishoils, the prussic phosphoric arsenious and other acids of the physician, and for the same reason, namely, that they are not adjusted to the nature and requirements of the great constitutional malady, whether intestinal vertebral articular or otherwise, that bears the name of tuberculosis, and which, therefore, the true cause not being held in view, becomes inveterate necessarily.

Tubercle, let us bear in mind, is not confined to man. It is the great morbid condition which, under similar circumstances, extends to human beings and the brute creation, alike. In every animal the congress of air not before respired with the

* In manchen Organen ungemein häufig, in andern selten. Rokitansky, *Lehrbuch der Pathologischen Anatomie*, Band I. S. 306.

† Nelaton, *Recherches sur l'affection tuberculeuse des Poumons.* Paget, *Lectures on Surgical Pathology*, vol. ii. p. 612. Paris, 1836.

blood is needful absolutely to lifes wholesome conditions. If the air habitually breathed have not been breathed previously, there will there can be no tubercle. But if the air which man or brute habitually respires, have been if but in part already respired, then tubercle is inevitable. The necessity of air not before breathed to healthy life and organisation, subsists throughout the immense range of animated creation. There is not an exception. The violation of this great universal law it is, and not the mutually subversive absurd and contradictory hypotheses hitherto alleged, which entails the blight of tubercle.

The inversion of law, when it subsists which leads to tubercle, implicates all living structures, each breathing thing. It is an inversion which violates lifes true conditions, the rule of health, and therefore as such tends to destruction and death.* The aim and final object of all inquiry into the operations of nature, as Treviranus† tells us, are the determination of the springs whereby she maintains her activity, and the detection of the noxious agencies by which those springs are disordered in their action. We discern the operations of the one in health, those of the other we witness in disease. And thus it is that we fall victims to tubercle, we and the creatures which in common with ourselves we debar of a fair supply of unprerespired oxygen. The dogs owned by the cellar population of Lisle do not escape, while the cows are stricken alike with their masters. Speaking of Paris cowhouses, the doors and windows, Huzard relates,‡ were low, the stalls so blocked up with manure that the poor animals could neither turn round nor lie down. Cough fever emaciation and lastly death, just as with human beings, assailed them in turn. On examination their lungs were found gorged

* La malattia divenendo inveterata, partecipano le glandole conglomerate e composte, e diventano la sorgente d' innumerevoli malori, l' ottalmia, la tisi, la tabe. Non di rado questa condizione scrofolosa si estende fino alle ossa. Brera, *Prolegomeni Clinici*, in Padova, 1823, p. 726.

† Das letzte ziel aller Naturforschung aber ist die Erforschung der Triebfedern wodurch jener grosse Organismus, den wir Natur nennen, in ewig, reger Thätigkeit erhalten wird. Treviranus, *Biologie oder Philosophie der lebenden Natur. Göttingen*, 1802, *Erster Band, Vorrede.*

‡ Huzard fils, Sur La Pommelière ou Phthisie Pulmonaire des Vaches Laitières de Paris et des Environs. *Annales d' Hygiène Publique.* Paris 1834.

with tubercle. All the dairy cows of Paris, says Roche* are phthisical.† The sufferings of the poor consumptive monkeys of our menageries have long been the subject of comment.† I saw them, related to me a medical observer, himself poor sufferer a victim to tubercle, leaning on their elbows, sighing, coughing up matter, with an air of pining wretchedness that no one could witness unconcerned. For such are the disastrous issues when the proper congress of uncontaminated oxygen with the metamorphic carbonaceous waste is barred.

Every day, almost, poor tubercle stricken children, their disease perhaps masked by infantile bronchitis and pneumonia, are brought to me. They are so poorly fed and tended. Their clothes are too commonly foul and ill smelling. By night they sleep in narrow airless chambers with others in one bed. The coverings slip over their heads. By day they are left in cradles, their heads equally covered. And when washed, it is in water cold and chill, even when labouring under diarrhoea and dropsy. Whole families are swept off. It is a wonder that any survive. The belief as to the noxiousness of night air, of damp air forsooth, like so many other prejudices derived from their betters, as we are wont to name ourselves, is almost universal among the poor. It was but yesterday that two infants were brought to me far gone in tubercular disease. It was a saddening spectacle. No exaggeration almost can overtop the drear reality. A woman, herself the victim of tubercle, also called. How many children may you have had, my poor woman, I asked. Sir, I have had seven. And how many of them yet live. Sir, they are all dead. How were they affected, what was their complaint. Sir, she replied in the local *patois*, they had a wee cough. They were her very words. There was yet another mother, from Limerick, with her baby. Poor little sufferer, it looked so ill, so wretched. It could eat nothing she said. It was on the well beaten track to that unseen land where so many babies go. She told me that she covered the childs head both by night and by day. How could any infant survive such treatment.

* *Dictionnaire de Médecine et de Chirurgie Prat.* Art. Phthisie.

† Broderip, *Zoological Recreations.* Arnott. Reynaud, De l'Affection Tuberculeuse des Singes. *Archives Générales de Méd.* Tome xxv.

Oh, if the wise and good and gentle women of these isles would but take up the cause of the poor consumptive tubercle harassed, cold chill dirt and starvation beset infant, if in word and action they would instruct mothers how to nourish and have a care of their children, it would be an angelic task. Poor helpless sufferers, what a boon to them would it not prove, what immunity from suffering, what rescue from untimely pining misery and decay. Each infant needs immersion not in cold but in tepid water daily. It ought to be robed in sweet soft pure linen, duly washed and changed. Its bandages should not be too narrow nor yet so wide or so tight as to embarrass respiration. A flannel coat over all, so as to equalise and maintain the temperature, one for the day and one for the night, should be worn at least during the cold season. Pointed pins ought never to be employed in a babys toilette. If not fed on mothers milk, milk warm from the teat of cow or ass or goat must be substituted, or otherwise well azotised pap consisting of whole meal bread, oat or Indian corn meal. To this if possible, a little new milk should be added. Arrowroot or Indian corn food as it is termed, is not fitted to sustain life. It is deficient not only in azote but in the essential phosphates. Most warmly enveloped the infant ought to be carried out twice daily, its mouth and nostrils left uncovered. Adequate warmth is not less needful than adequate nourishment. As soon as possible the baby should occupy a little curtainless bed, stuffed with flock or clean straw, and provided with warm fleecy blankets. In all seasons and weathers enough of the upper portion of the sleeping chamber window should be pulled down to insure as perfectly pure an atmosphere within that sleeping chamber as subsists out of doors. A door opening on a stair or an open window in an adjoining apartment is not enough.

When people insist so on the hereditariness of consumption, why do they not insist on the far more certain hereditariness of health. For health is assuredly hereditary, although consumption be not so. How many labour under consumption whose predecessors have not been known to experience it. There now lies before me the register of one hundred and fifty cases, I had intended to make it a thousand, of consumption

taken just as they came, in succession. It is but a sample of an experience going on for many years. Merciful heaven, what infirmities, what struggles with fell disease and death, were there. No fabled gales from Cocytus or Phlegethon ever equalled in fell malignity the bedroom atmosphere that sealed the fate of these poor sufferers and led them to their doom. All these cases would deserve especial mention, but I can only advert to a few.

For two years C. a clerk was confined by day. By night he slept in a close chamber. Expectoration of blood and matter was the final result. For people, as Thackrah says* may live on limited food, but not on a limited air supply. Two sisters after a long course of indoor seclusion incurred phthisis. Of these one by dint of open windows by night and suitable treatment by day, fortunately rallied, but the other perished. A linen merchant after two years occupation of a low ceilinged sleeping chamber and curtained bed, began to spit tuberculous matter and blood. He too recovered after very strenuous efforts in his behalf. But except these, all perished. Some of the cases occurred in the Irish Police force, which, although a picked body of men and much out of doors by day, are apt to sleep in close and crowded chambers by night. A young muslin worker who had toiled for three years in an ill aired Glasgow wareroom by day and reposed in one no better aired by night, presented himself with the right lung quite disorganised. His face was the colour of clay. The hearts action was feeble and tumultuous in the extreme. Poor tortured sufferer he did not linger long. Laverty spat up blood and matter. His case like that of some others was coupled with phthisis of the larynx. Ann Mara, a serving woman, passed her nights in a den off a common pàssage. Profuse sweating hectic purulent sputa and emaciation were her sorry tale. On the first day of September 1856, there were brought to me on one and the same morning, a babe aged three tuberculous in both lungs, a boy and girl each strange to say with psoas abscess, besides scrofulous cases of varying severity. A number

* *Effects of Arts Trades and Employments on Health.* London, 1831.

of students, young men of promise and ability, whose days were spent in narrow chambers crowded with books and papers, the nights in airless sleeping rooms, without outdoor effort or country walks, were among the victims. Downing, a labourer, was only twentyfive when lobular pneumonia crepitus and vomicae overtook and slew him. Eliza Hall, instead of the vigour and grace of nineteen, was feeble spent and worn. Profuse mucous rattles and tubercle beset lungs soon brought her brief career to a close. A labourer from the country, poor forlorn fellow, slept in a chamber with seven others, and perished, as most probably did his companions, with hemoptysis and purulent sputa, accordingly. A wood turner, only eighteen, came labouring under excessive hemoptysis and a cavity under the right clavicle. His case with regard to room accommodation was quite as infamous as the preceding. A sailor lad far gone in tubercle, had habitually slept, he told me, in a narrow airless crib, need I add with what result. Ann Cairns, barely fifteen, passed her nights along with two others in a very small chamber. Her breath was a mere stench. She spat up blood and matter. Both lungs were gone. Hapless Ann Cairns. Hunter, a carpenter, has incurred whatever could render a man diseased and keep him so. Both lungs are diseased and rotten utterly. I am consumpted, I fear said the poor fellow, and posted* when I try to mount a stair. Margaret, no more a pearl, coughs in kinks and expectorates blood tinged with matter, incessantly. Although but thirtythree, poor phthisical creature, she has had eleven children of whom seven are dead. David, a gardener, slept in a small chamber with four others surrounded by fruits and flowers, and never opened a window. Only twentyfour, he has lost two and forty pounds in weight. He is the last of his humble line and, spitting blood and matter, ceaselessly, must soon remove to a fairer garden. For six long years, said H. M. I toiled hard in New York, typesetting, in a close stoveheated chamber, and slept with two others in a small airless room. He should never set type again. MacNair, a teacher, had swollen feet and legs, and such a cough. He was barely eighteen. Poor MacNair. M. slept in a

* *Pusten*, Danish, to breathe hard.

stagnant recess behind his shop, so that great emaciation night sweats and hectic too surely followed. T. directed for long hours, daily, twenty shirtfinishers in an overheated unventilated workroom. Her heavy spit and mucous rattle, which had been treated with codfish oil further thrust in soaked pledgets into each axilla, revealed the oft repeated tale of remediless decay. Graham slept in a chamber eight feet by ten. First, his consumptive wife perished, then, shorn of every element of healthy vitality, coughing up blood and tubercle, he too disappeared. Mary and Jane left the country two healthy girls together. But a couple years of settle beds and airless garrets soon induced bloody and purulent sputa, deaths too sure forerunners. Jackson harped nightly till far in the morning in crowded unhealthy rooms, then slept by day in a chamber poisoned with rebreathed air. Gentle and long enduring he now harps elsewhere. M. had returned from his spiritual charge in Pennsylvania. He speaks in whispers. He has tubercle of the larynx and trachea, and will surely die. A fine lad not long from the country, slept in an airless hole with six others. He spits blood and matter, and coughs so. He will soon rest. A carver of stone has large mucous *rales,* as the French term them on one side, bronchial respiration on the other. He will carve stone no more. Quite an array of seamstresses clerks bakers tailors and others presented themselves, all occupying rooms fouled with one or two per cent of carbonic acid gas by day, and passing their nights in chambers yet more foul and tainted than by day. Fatal tubercle under such circumstances was inevitable. Alexander the hackler, toiling all day long in dusty fuzzy hackling rooms, supported a wife sister two small children and a mother. They lived on his slender earnings by day, and by night they consumed the vital air that ought by rights to have been his. So he grew scant of breath, posted the dear young fellow termed it, spat up blood and matter, and thus perished in his prime. It was so with the other poor sufferers. They illustrated the dread categories of disease and death variously. For as Rostan* observes, tubercle

* La faiblesse et l'amaigrissement sont le résultat inévitable de ce genre de altération puisque elle empêche l'hématose source de toute force et de toute nutrition. *Cours de Médecine Clinique,* 3 *ième Ed. Diagnostic Special.*

of the lungs hinders the proper hematosis of the blood on which all nutrition and life itself depend.

The frequent rapidity not to say suddenness of the phthisical outbreak, precluding the very possibility of life or hope, is often most terrible. Two sisters slept together in one bed, side on to the wall. The one who lay inside contracted a galloping consumption and perished, whereas the other who slept outside and secured comparatively a better air supply, for on such apparently trifling circumstances do the issues of life and death oftentimes depend, escaped. A carpenter only nineteen, who had come full of life and health but nine months from the country, previously, not finding immediate occupation in his business, took the first thing that offered. Unhappily for him that occupation, it had to do with picking rags and bones, was most unwholesome. He further slept in a close garret with four others. There was not a sound beneath either clavicle save the glug glug of masses of pus and softened tubercle. He breathed, ah so painfully. Within three days of consulting me this hapless victim of ill requited industry slept beneath the clay.

The wear and tear of the living organism entail an incessant absorption of oxygen and a corresponding oxidation and elimination of the carbonaceous and other waste. The countless ramifications of the pulmonary arteries, along with the innumerable aircells, bring the blood in contact with the oxygen in the terminal cells and systemic capillaries where the final interchange, the absolutely unavoidable and indispensable synthesis of oxygen and carbon waste, takes place. It is the *pons asinorum* of physiology and pathology, alike, which, if the inquirer prove unequal to cross, further progress is impossible. Carbonaceous waste and oxygen are inconceivable healthily apart, cannot as thus subsist *singulatim*. We respire some sixteen or eighteen times every minute, inhaling each time say twenty inches cube, about the size of an orange, and vitiating a foot cube in five or six minutes, inhaling indeed many hogsheads of air, oxidising many hogsheads of blood within the twentyfour hours. The inspired oxygen amounts to twentyone per cent of the inspired air, and of this oxygen the blood imbibes about one fifth part

or twenty per cent in all. The air expired is not the air just before inspired but a mean of the large mass, from one hundred and fifty to two and even three hundred inches cube, constantly stored up within the chest. The amount of air inspired, the act of inspiration being much more powerful than that of expiration, and depending partly on the will but mainly on the force and frequency of muscular effort,* is equal to about a tenth or twelfth more or less of the lungs habitual contents†. Schöffer‡ and others§, reckon the carbonic acid given off at 4·35 per cent of the expired air, or twentyfive feet cube weighing fortysix ounces or from ten to twelve ounces solid carbon, which would amount to thirteen parts out of fourteen of all the carbon supplied,‖ in the twentyfour hours. A lower, and, perhaps under ordinary circumstances juster estimate, is eight ounces of solid carbon or thirty ounces carbonic acid gas within the same period. Much however will depend on the amount of work and the synergy of tissue metamorphosis in health and disease.¶ When quietude is too prolonged, nature takes steps by interposing now and then what we call a sigh or in other words a deep inspiration, to afford relief. Exclusive of the mechanical assistance imparted by the chests expansion to the passage of the blood through the pulmonic vessels, the bloods sufficient arterialization involves respirations of a certain duration and depth.

When the oxygen supply is inadequate, when air already breathed is presented any of it a second time for respiration,(1) and when the effete carbon is not adequately oxidised, then conditions are present with which no health no stamina can long successfully contend. The difficulty of night ventilation

* Reiset, Recherches sur la Respiration des Animaux. *Comtes Rendus*, Aug. 1863.

† Milne Edwards, *Zoology*, 2d Ed. Knoxs tr.

‡ *Zeitschrift für Rat. Med.* Band ii. S. 89.

§ Todd, *Cyclopædia of Anatomy and Physiology*. Art. Respiration.

‖ Herepath, *Chemistry in its Relations to Medicine*. Bristol, 1863.

¶ Der Energie des Stoffwechsels und das Verhältniss gewisser pathologischer Züstande zum Respirations process. Gorup Besanez, *Anleitung zur Zoochemischen Analyse*, S. 230.

1 Un aria corrota ed incarcerata. Brera, *Prolegomeni Clinici*. In Padova, 1823, p. 727.

is greatly aggravated by reason of the vicious construction of windows which, in poor dwellings especially, are often not made to pull down. The little wedge or quoin inserted on each side to prevent the descent of the sash, viewing it as an impediment to the introduction of unbreathed air, has proved the most lethal instrument of human destruction in the whole world. For there is no other way than by a door as it were into the ocean of the atmosphere, and the open window is that door, to secure an ever fresh supply of untainted oxygen and as I maintain entirest immunity from scrofulous disease. How saddening in truth is it to see windows immovable as the wall, with pallid unhealthy women and children within, windows perchance obscured with cobwebs and dirt, and yielding no adequate inlet whether to light or air.*

Although air warmth food and cleanliness be cardinal conditions and essential to life, still the most important of all health factors is air, air pure and undefiled alike by night and by day. In sleeping chambers it secures a better and more perfect supply by having the surface of the bed not higher than fourteen or sixteen inches from the floor. But will not the carbonic acid from the breath, persons ignorant of the elements of physics have said, settle down and so hurt the sleeper nigh the floor. The oxidised carbon which is liberated from the blood does not however separate, but unites with the inspired oxygen, in the proportion of six parts by weight of the one with sixteen of the other, and is then diffused speedily through the general atmosphere, which itself contains from 3·7 to 6·2 volumes in every 10,000 volumes†. This gas, then, though heavier *per se* than air, in the same way as oxygen is heavier than nitrogen, is always diffused through the air, at large, just as oxygen and nitrogen are diffused through each other. Here, as in all things, natures arrangements for the purification and reintegration of soiled air are supremely perfect. And the actual conditions of the untainted atmosphere are the very best both in health and in disease.

* MacCormac, *On the Condition of the Poor in Towns.* Dublin Social Science Meeting.

† Tomlinson, *Pneumatics*, 2d Ed. p. 3.

It is a standing miracle of God. It is by interfering with nature that we suffer. It is by destroying and reversing her arrangements, which are the divine arrangements, only, that we incur tubercle.

But pure air is needful not alone in the act of respiration but even in that of swallowing. The due aeration of water is one of the essential elements of its salubrity.* Milk and water, for example, absorb a large per centage of the ambient atmosphere, and if that atmosphere be tainted the fluids which we imbibe become tainted, likewise, in fact appreciable elements in the long list of the agents of disease and death which so incessantly besiege the health and homes of men.

The mainly unreasoning dread of night air, so termed, is a great impediment to free ventilation by night. And, yet, day and night air is the same virtually, does not differ appreciably. The air by night, whether damp or dry, is equally pure equally salubrious with the air by day, and calls not less solicitously for ceaseless admission into our dwellings. It is not damp air the person being protected that hurts, not foul air but re-respired air. Air, ere it reach the lungs, is always damp. Quite dry air is irrespirable. It needs no peculiar or unusual habitude in order to respire what is termed night air. Exposure to, contact with, the day air equally prepares us for exposure to and contact with the air by night. We can multiply our coverings by night with even greater ease than we can by day, and with the most perfect certainty of producing and maintaining warmth. We can breathe pure air by night, were it for the very first time, with as much impuuity and as much benefit as were it to partake for the first time of roasted meats or turtle steak. Good heavens, how is it that people are so wildly mistaken, as if the great wise Deity, as he does by every exquisite and perfect adaptation, did not intend that we should make use of the purest sweetest air day and night and always. Cover yourself with blanketing as much as you will, draw the coverlet over the exposed ear if you choose, but for Gods sake breathe air no portion of which has been respired before. The prospective results of breathing

* Burnell, *Hydraulic Engineering*, vol. ii., part ii.

purest air by night are so infinitely desirable, the immediate enjoyment is so great, that it only needs a trial to be approved of and adopted for ever.

I am far from saying that every one who sleeps with a closed window must needs incur tubercle, for the ventilation even with a closed window, may be so far perfect as to obviate a consummation so disastrous. But I assert and declare with all the emphasis in my power, that in the immense majority of instances of tubercular deposits, the sleeping chamber windows have been habitually closed. I shall not say that consumption concurrently with perfect bedroom ventilation is quite impossible, for the day supplies of air may be so very bad as perhaps to entail tuberculosis unavoidably. Yet, if not impossible, it is next to impossible. In the immense majority of instances, then, the morbific factor is the again respired sleepingroom air. Tubercle, indeed, is simply impossible in the case of persons who respire habitually air not prerespired, and who sleep in an atmosphere incessantly renewed.

There goes on in the living organism a constant movement of synthesis and analysis, of composition and decomposition, of absorption and exhalation, of assimilation and disassimilation, in virtue of which particles appropriated to day undergo rejection the morrow, ensuring a perpetual renewal and purification.* Thus, the body we lived in yesterday is not the body we live in to day. If a person lose and gain we shall say two pounds of solid ingredients, daily, it is plain that a complete interchange, coupled with a new frame, may take place in about eighty days. In fact, the carbonaceous, are actually twice as great in amount as are the collective excreta from both the bowels and kidneys. The elimination of waste and purification of the blood are accomplished by a process so closely resembling slow combustion, that it seems futile to contest it.† Frogs confined in nitrogen give off carbonic

* Das ganze organische Leben beruht auf der ununterbrochenen Stofferneuerung, der Ausscheidung des alten durch den Lebensprocess untauglich gewordenen, und wiederaufnamenen organischen Stoffes. Moritz, *Zimmergymnastic*, Leipzig 1858.

† Seit Lavoisier diese Entdeckung gemacht hatte war die Quelle thierischen Wärme kein Geheimniss mehr. Pouillet Müller, *Lehrbuch der Physik*, Braunschweig 1852, B. I., S. 607.

acid gas, the residue doubtless of prior acts of respiration. Magnus indeed went so far as to say that oxygen had no chemical action on the blood. Nothing could be more absurd. In certain experiments detailed by Harley* before the Royal Society, it was shown that in air brought in contact with recently drawn blood, ten per cent or so of the oxygen disappeared. And Sachs† found that when blood freshly taken from a dogs carotid was exposed for some hours to oxygen, the latter was replaced by carbonic acid gas. In its inchoate state of oxygen, or as converted into carbonic acid, each gas is dissolved alike by the blood. For as Haller‡ remarks, you never detect air in the blood healthily. As for the pulmonic watery exhalation, it is impossible to say how far it arises from immediate oxidation and how far from aqueous matters already extant.§

By a never remitted series of phenomena at once the most wondrous and effective, the waste carbon is got rid of, and the animal temperature is maintained, without more than a degree of difference, as John Davy has shown, from England to Ceylon. In children, however, the changes are very much more rapid than in adults, and the consequent waste and renewal of tissue proportionably great. How enormous, how incessant, then, will prove the mischief when the healthy order of respiration is interfered with, and when infants for example are suffered to respire prebreathed instead of unprebreathed air.‖ In the case of laborious adults, the tissue conversion is likewise vastly quicker than in the indolent and inactive.¶ Oxygen is borne along in vast masses, so to speak, in the

* *Chemical Gazette*, May 1856.

† Reichert u. Du Bois Raymond, *Archiv*, 1863.

‡ Nulla unquam in vivo calido animali bulla aerea visa est nisi post vulnus. *Physiologia.*

§ Pettenkofer u. Voit, *Annalen der Chemie und Pharmacie*, II Sup. B. 3 Heft, Leipzig 1863.

‖ La tuberculisation en effet n'est jamais plus fréquente que dans les premières années de la vie. Trousseau, *Clinique Médicale.* Tuberculisation chez l'Enfant.

¶ Les phénomènes de la respiration en détruisant les matériaux devenus impropres à la vie, font subir à l'organisme des pertes que les fonctions nutritives sont appelées sans cesse à reparer. Le sang vient porter dans l'économie l'élément destructeur, l'oxygène, mais elle charie en même temps des matériaux réparateurs en échange de ceux que les procédés de la vie ont soustraits à l'economie. Dumas, *Chimie.*

current of the circulation, and the waste matters in the blood undergo rapid oxidation. In fine, the pulmonary circulation is greatly hurried, while the quantity of air inspired and of carbonic acid expired, is marvellously increased.*

Paget† does not discern the evidence of design in the infliction of cancer or tubercle. Cancer, doubtless, arises from some infraction yet to be discovered of the organic law. For this is the law of God as connected with the universe in which we dwell.‡ And as an American medical writer has said, to gain a knowledge of his law is to gain a knowledge of his goodness§ and I shall add his wisdom. As for tubercle, it is undoubtedly the result of an infraction of that respiratory law which forbids the inhalation of the same air unless purified oftener than once. There is an arrest of the oxidation of the metamorphic waste so all essential|| to the mighty cycle of healthy organic vital change. Once deposited, however, the matter of tubercle and carcinoma, alike, appears capable of displacement, metastatically or emboli wise, by the blood current itself. Cohn,¶ indeed, describes an instance in which tuberculous matter was evidently translated from the mesentery both to the parenchyma of the liver and the portal vessels themselves.

The uses of oxygen are incessant as they are important. Oxygen is a sort of material providence. It is as the mortar in the wall, the sun in vegetable growth, the very condition and nexus of all life, all organisation. The arrest of oxygenation is simply the arrest of life itself. Irrespective, however, of its ordinary forms and uses oxygen becomes electrified. In this condition, termed ozone by its discoverer, it wages incessant war with every species of putrescence and decay. Marvellous is it indeed. Without its

* Parkes, *Manual of Practical Hygiene*, London 1864, p. 322.

† *Surgical Pathology*, vol. ii., p. 612.

‡ Sutherland, *Appendix to the Cholera Report.*

§ Cocke, *Theory of Medicine*, New York 1853, p. 181.

|| L'oxydation intravasculaire est un phénomène incessant et tellement necessaire qu'il ne peut être entravé, anéanti, sans que la vie soit immédiatement en péril. Mialhe, *Chimie Appliquée à la Physiologie*, Paris 1856, p. 29.

¶ Alle anderen organe waren frei von Tuberkel. Der embolische Ursprung der Lebertuberculose war hier zweifellos. *Klinik der embolischen Gefässkrankheiten*, Berlin 1860, S. 103.

beneficent cleansing powers, we should be quite unable to cope with the foulnesses that surround us. Thus incessantly used up, it is as incessantly recreated.* Ozone subsists in all pure atmospheres.† It is continually wafted from land and sea to our cities and towns, and there expended in rendering them more inhabitable. The electrical agencies at work in the atmosphere reproduce it ceaselessly, while the impurities resulting from the processes of life consume it as ceaselessly. It can be produced artificially, too, as through the electrolysis of water and the slow combustion of phosphorus. Boettger evolved it by the mutual action of two parts dry permanganate of soda and three of hydrated sulphuric acid. Permanganic acid, indeed, liberates ozone in the presence of foul organic matters, oxidising and destroying them utterly. It is doubtless useful in the respiratory process, itself, aiding and intensifying the beneficial efficacy of ordinary oxygen. The great abundance of ozone by the shores of the sea, and in the country, everywhere, augments the benefits of a resort to both. It adds to and enhances the advantages of night ventilation. Mapother‡ mentions that slips of calico soaked in a solution of iodine, thickened with starch powder and slightly heated, were browned in four hours when hung five feet inside his bedroom window, but were not at all affected when the doors and windows were kept closed.

Man would realise without effort, and yet short of effort, as nature preaches ceaselessly, we cannot realise lifes goods. Effort§ is needful to renew wholesomely the materials of the living organism,‖ and to promote that vital oxidation whose complete arrest is death.¶ A recent pathological writer of eminence,(1) lays no stress on air, even doubts the efficacy

* Scoutteten, *L' Ozone, ou Recherches sur l'Oxygene Electrisé.*

† Babo, Beiträge zur Kentniss des Ozons. *Annalen der Chemie*, Leipzig 1863.

‡ *Lectures on Public Health*, Dublin 1864 p. 36.

§ Die susse Wurze des Lebens ist nur ein Lohn des Thätigseins. *Zimmergymnastic*, Leipzig 1863.

‖ *Heilgymnastic*, Id.

¶ Arrêter brusquement l'oxydation vitale et produire par là une mort instantanée. Mialhe, *Chimie Appliquée* p. 576.

(1) Lebert, *Anatomie Pathologique*, Art. Tubercule.

of hygienic measures in exempting our species from the ravages of consumption. And, yet, to what end is pathology unless to further lifes desirable conditions. The organism is exquisitely precalculated for the renewal of the material and rejection of the interstitial wâste in every muscle and viscus, every bone and nerve. The process is effected without error or shortcoming so long as we do not meddle needlessly and hurtfully with the silent hidden processes never for an instant pretermitted in the great laboratory of the living organism. Whenever through evil management or sad necessity the effete material is suffered to gather in the economy, there is an end for the time being and possibly for ever to healthy life and action.

Yesterday, a young person was brought to me perfection itself in form and feature, but casting off blood to that extent from the lungs, that she found it impossible she said to lie down. On inquiry it appeared that although living in a locality replete with every natural element of health and salubrity, she slept in a ground floor chamber, in a curtained bed, with closed door and windows, no fireplace and two other occupants of the room. The day preceding it had been a creature just verging into womanhood, but spitting blood and matter, equally done to death by sleeping with an aged relative who, out of sheer love and fondness, had debarred her young charge of every practicable outlet of wholesome life and action. So feeble was the respiratory nisus that even the faintest murmur was not to be detected beneath either clavicle.

Unless pure air, air without taint or admixture, be respired incessantly it will not avail. The breath of man, rebreathed, sooner or later is death to himself and to his fellows. Sluggishness and inactivity* enfeeble the breathing process, impede the bloods depuration, and the offscouring of the metamorphic waste. There is all imaginable difference between the languid perfunctory action of the voluntary or

* La vita sedentaria e di gran lunga più favorevole a questa malattia che non e il menere d'un vita operosa. Omodei, *Annali*, Vol. lxxi, p. 357.

semivoluntary muscles of respiration and that which ensues in a life of vigorous effort. And it is only in the latter case that the ancillary muscles are called into play at all.*

How often do we find a single member of a family pining in consumption or eaten up so to speak with scrofula, while the other members having lived differently are in the enjoyment of perfect health. If the doctrine of hereditary decline, entertained on the principle of *omne ignotum pro mirabile*, had any real foundation, all the offspring of given parents should be tuberculous which we know is happily only sometimes the case. A young girl miserably tortured with suppurating glands ending in ulcers which almost encircled the neck, had been vainly treated with iodine and chlorine inhalations, barytes, and fish oil. It was even proposed to excise the ulcers. Iron, meat, and wine, with life on horseback, open windows by night, and water dressing for her sores brought her completely round. No other individual in the family suffered. The cadets of certain French houses who enter the church are invariably, observes Baudelocque, the only scrofulous members. Inactive habits and indoor life rob multitudes of health and energy, and cast them ere their prime into the ravening trench ever yawning for the consumptive. Such was the case of a printer whom his brother a farmer, big and brawny, often came to visit. The countrymans great kindly voice filled the chamber, his heavy footfall shook the floor. The contrast was striking, immense, and yet both, for I was careful to ascertain the fact, had been in all respects alike at first. Ah, how many such instances crowd upon my memory. Three lads and as many girls, belonging to different families, now seem to stand before me. They slept in stairhead rooms without open windows or renewed air. All, poor things, contracted phthisis and, after the usual alternations of suffering and decay, perished. The surviving members of these families I told to live differently. They did so, fortunately, and to this day they exist exempt from tubercle.

* On fortifie les poumons par la respiration d'un air pur, la parole, les chants, la course. En activant les mouvements de composition ou de décomposition des tissus l'exercice tend à empêcher les tumeurs et les dégénérescences. Maquel, *Perfectionnement ou Degénération de l'Espèce Humaine*. Paris 1860, p. 220.

It is impossible to urge in terms too strenuous, too explicit, the indispensableness of open air life and effort in respect of the prevention of disease, in general, and of phthisis in particular. Speaking of the gymnastics of Colonel Amoros, Fourcault characterises them as the very providence of health. With them the morosest children became gay.* The same may be said more or less of the systems of Clias Chiosso Ling Triat Pichery Frechet, and of the Huguenins, father and sons. If I have so much as a word to say against gymnasts, it is that they sometimes push matters a little too far. They would make people needlessly strong. Activity and health, with strength enough, are better than excessive strength alone. Besides, there is a risk in developing too much the muscles of voluntary life. And, then, these gymnasts are not commonly enough impressed with the immense importance of an ever renewed atmosphere. I knew a teacher of gymnastics who, owing to neglect in this respect, himself perished of phthisis. Otherwise, the *Turnvereins* of Germany, modified by the requirements of sex and age, as well as inclusive of unprebreathed air, should be extended to every English Irish and Scottish school and town. For a thousand and yet a thousand reasons is systematised muscular effort desirable. The modern spread of boating cricket croquet volunteering and other forms of open air life and effort cannot well be too much commended. Oxford freshmen, youths who go to sea, recruits and others, often gain a brace of inches in chest girth within a month or two. Protesting always against the tendency to excess, English trainers often work a complete metamorphosis in respect of candidates for walking racing and boxing competence. Two hours of daily outdoor effort, with open windows by night, would prove a perfect godsend to the pallid, flabbymuscled, spiderarmed, slendershanked, etiolated clerks students seamstresses and apprentices of our cities villages and towns. How many are all hips and legs and belly, disfigured with blubbery fat or else inordinately lean.

* Avec la gymnastique les enfans les plus moroses deviennent gais. Elle entretient la santé. Elle donne aux muscles plus de force. Elle corrige une foule de vices de conformation. Fourcault, *Causes Générales des Maladies Chroniques*, p. 352, 4.

Where are the arms to speak of, where the big deep chests, the well developed pectoral recti trapezius intercostal and other muscles, where the broad shoulders epauletted with the fleshy deltoid. When it comes to a pinch in respect of saving life or limb from fire or water, how few can sustain themselves with two arms much more one, how few are able to climb or run or swim. And, yet, all the muscles are more or less subservient to lifes requirements, more or less ancillary to respiration, the furtherance of tissue metamorphosis, and the utter elimination of the interstitial waste.

This is a state of things which it is an extreme omission not to remedy, an act of *lese majesté* to the great estate of man. Why, I would ask, so far as training goes, should not the left hand and arm be exercised and developed equally with the right. It would prove an immense benefit to the left lung, nay to both lungs. Man, by nature, is not simply sinister or dexterous, but ambidexterous. He has not even the proper use of the right arm by reason of too much neglecting the left. For the right haemal division of the frame cannot be developed, adequately, so long as the left is so much abandoned to itself. The feet are cramped, distorted, and even diseased, despite of the judicious prescription of Camper and more recently of Meyer, by reason of not wearing low heeled and straight, instead of crooked boots and shoes. The foot, naturally so exquisitely and symmetrically formed, becomes too often a shapeless mass hardly fit to stand upon, much more to walk with or run. Stays, as worn by the richer classes, induce deformed spines, distorted shoulders ribs and haunches, and more or less impair full respiratory effort. In fact, staybound women, to their proportionate loss and peril, cannot use the diaphragm in respiration at all, whereas men use both diaphragm and intercostals. The natural undulatory movement of the frame is lost, and the poetry of motion is at an end. For well adjusted effort regulates the form, does away with the humpy shoulder, the shuffling shambling stumbling gait, the buckling knee, amplifies the spider shank and feeble arm, in short confers comparative grace capability and activity on all.

The majority of workrooms are mere lurking holes of burrowing disease. Not long since, impelled at once by interest and curiosity, I looked into a sort of den behind the shop of a London tailor. In this hole, for it was indeed no more, a number of men with barely room to ply their implements, sat elbow to elbow and knee to knee. The industrious and respectable employer spent his days betwixt shop and workshop. Only forty and yet seized with all devouring phthisis, he is now at rest. Such is the cupidity of some, coupled with the unrelaxing exigencies of trade, that nothing short of the life and marrow of humanity will satisfy them. People adore an idol of more hideous attributes than any worshipped by the New Zealander or yellow Fiji. So feeble becomes the respiration in multitudes of overtasked underfed workmen and workwomen, poor exhausted fragile creatures, condemned habitually to breath air laden with filthy irrespirable matters, that they seem hardly able to speak or breathe. Compare, only compare, with such a group of hodmen or labourers, a bevy of rosy deep chested* Cornish or Scottish fisher girls. Ah, how great, how immense is the difference. The sonorous period, the lusty carol, rolls without an effort from their lips. They hardly seem of a like race. Yet such as they and better still than they, might all other men, all other women become.

The proper admixture and preparation of the blood ingredients, the invigoration of the heart and lungs, the development of warmth and strength and nerve force, above all the vital oxidation of the carbonaceous waste, not only in the lungs but throughout the organism, depend severally on the points already traced. As the whole body

* . . . *νῦν δὲ κλέος ἐσθλὸν ἀροίμην,*
Καί τινα Τρωϊάδων καὶ Δαρδανίδων βαθυκόλπων.
ΙΛ. xviii., 122.

ἀλλὰ γὰρ ἤκουσ' αἶδ' ἐπὶ πρᾶγος
πικρὸν Ἀντιγόνη τ' ἠδ' Ἰσμήνη,
θρῆνον ἀδελφοῖν· οὐκ ἀμφιβόλως
οἶμαί σφ' ἐρατῶν ἐκ βαθυκόλπων
στηθέων ἦσειν ἄλγος ἐπάξιον.
ΕΠΤΑ ΕΠΙ ΘΗΒΑΣ.

by a divine and altogether incomprehensible *consensus* is formed from the blood, the *chaire coulante* or running flesh, so the whole body, flesh and bone and nerve, by a consensus equally divine, is again resolved into blood ere, as disorganised and effete, it passes away and disappears for ever. The bones might be supposed to require a little longer period, but that they also as well as the nerve structures are just as rapidly integrated and disintegrated, is evident from the copious daily renal discharge of sulphur phosphorus magnesia and lime. The excretion of effete nitrogen in the convenient form of uric acid and urea, and of effete carbon in the form of carbonic acid, is not less incessant than that of the effete phosphorus, and the effete hydrogen oxygen magnesia lime iron and sulphur. During these processes and under favourable conditions as to respiration nutrition and effort, the muscles become more developed and less fatladen, the cellular tissue less flaccid, the joints, firmer and yet more supple, and the bones themselves more solid points of resistance and support.

Atmospheric oxygen, in virtue of the respiratory act, permeates the entire bronchial tree, passes by endosmosis through the capillary parieties of the aircells, attaching itself to the blood globules, oxidising more or less the waste hydrogen and waste carbon, disengaging heat and electricity in every portion of the organism in the exactest ratio of the activity and the wholesomeness with which the function is discharged. The metamorphic matters thus oxidised, in fine the waste and utterly useless residues, are then in a position to be got rid of, their further presence being only hurtful to the economy. Exclusive of carbonic acid and watery vapour, in other words the oxidised carbonaceous and hydrogenous waste, the lungs also excrete minute portions traces rather of ammonia, which exists indeed in the air we breathe, light carburetted hydrogen, even urate of soda and urea. These, alone, with other foul residuary matters, doubtless give rise to the faint and sickly not to say putrescent odour which haunts the ill aired living and sleeping chamber, nay the very bedding and garments of adults and hapless children exposed to its evil influence.

The body in respect of the oxidised waste carbon may be compared to a slow combustion stove. With each contraction of the muscles, nay every act and pulse of life, oxygen is absorbed, heat in constant ratios is developed, while oxidised hydrogen and carbon are given off and carried by expiration away.* This metamorphic carbon it is which being re-breathed is death, death in the breath. When permitted, however, to find issue in the boundless atmosphere, and undergo natures reparative chemistry, it becomes harmless and inoffensive as it was before nocent and injurious.

The lungs, however, although by much the greatest are not the only decarbonising agents. In warm climates the liver, as regards the bloods depuration, assumes a great increase of function. But even in such climates the office of the lungs in respect of the bloods depuration remits never. In both the Indies and in Africa tubercular deposits, when people pause in chambers surcharged with rebreathed air, ensue with equal certainty as here. Not many years have elapsed since the mortality from consumption in our West India regiments was excessive, and was just as bad in the East, owing to the men being obliged to lie in hammocks with only twentythree inches side space.† I remember when a boy to have visited barracks with beds in tiers one over the other, two men in each bed. A like evil arrangement subsisted in Porchester Castle where the French prisoners were confined. It had not been altered when I was last there, and I suppose subsists still though happily there be no prisoners. I am convinced, says Clarke, that the organs which bear the first brunt of the vitiated air in close over-crowded rooms soonest suffer. In Africa, where his great experience lay, the scrofulous diathesis he states is common as it is in Europe.‡ This gentleman who concurs, he has assured me, in all my views, informs us that phthisis, contrary indeed to my own prior prepossessions, is frequent among the negro.§ Where in truth is it not frequent, the exceptions are easily resumed.

* Liebig, *Animal Chemistry*, tr. p. 14.

† Parkes, *Hygiene*, p. 205.

‡ *Topography and Diseases of the Gold Coast.* Epidemiological Society, 7 May 1860.

§ *Short Notes on the Prevailing Diseases at Sierra Leone*, p. 11.

A writer in the *Westminster Review*, commenting on my doctrines, went so far as to state that phthisis was absent in Iceland, and referred me to Schleisner§ in corroboration of the fact. On procuring Schleisner, however, I found that the poor Icelanders, though such be their pretention, have no immunity from phthisis, *lungtaering* as Schleisner in his interesting volume terms it, whatever. Far from it, indeed, they are further tormented with cystic worms, cysticerci, in the lungs, doubtless owing to the numerous dogs which everywhere shed the eggs which thereby get into the drinking waters and food of men.

It is singular how people will travel to a distance to determine facts, which, if they would but take the trouble, they might settle at their own doors. Thus, in the discussion on my paper, *On Certain Vital and heretofore undetected Relations subsisting between the living Organism and the outer Atmosphere*, read before the Surgical Society of Ireland, I was referred with something like a taunt to the case of the Esquimaux as a people among whom consumption was never known. I was however so fortunate as to be able to furnish my opponent with an extract from a communication from the surgeon to the Plover exploring ship. 'I found among the Western Esquimaux,' observes Mr. Simpson, 'individuals of unquestionably scrofulous habit with suppurating glands and indolent ulcers. Several instances of phthisis came under observation, and one was attentively watched which ran a rapid course. A girl who appeared in the full bloom of health in September, was cut off early in the winter after having shown all the symptoms of a galloping consumption.'

A unity of function subsists throughout creation, just as surely as does the unity of organisation proclaimed by Cuvier Goethe Oken Humboldt and St. Hilaire. The law of respiration, then, Mac Cormacs law since I claim to have discovered it, subsists alike from the equator to the pole, extends to all breathing kind. WHEREVER THE AIR HABI-

§ *Island Untersogt fra et Laegevidenskabeligt Synspunkt*, Kjöbenhavn 1849.

TUALLY RESPIRED HAS BEEN RESPIRED, IN WHOLE OR IN PART, BEFORE, THERE, TUBERCULAR DEPOSITS ARE FOUND, AND WHEREVER THE AIR HABITUALLY RESPIRED HAS NOT BEEN RESPIRED, IN WHOLE OR IN PART, BEFORE, THERE, TUBERCULAR DEPOSITS ARE IMPOSSIBLE AND CONSUMPTION AND SCROFULA ARE UNKNOWN.

I claim for my demonstration, as founded on indefeasible evidence and natural law, that it is as a chain of adamant. No other conclusion than mine, I submit, can be arrived at consonant with the very necessities of thought and the initial principles of all physiology. The second respiration of the same air sooner or later inevitably induces tubercle, while the habitual respiration of air that has not been prerespired as inevitably realises immunity from tubercle. It is the persistent respiration of the already breathed air that induces the terrible frequency of scrofula and consumption that subsists in Norway Sweden Denmark Russia Prussia Bavaria Austria Italy Spain Portugal Holland Britain France and the United States, in many places actually implicating more than a fifth of the entire population. These diseases are everywhere the concrete of dense aggregations of humanity, because such aggregations imply bad water supplies, bad drains, bad light, and above all bad air. According to some figures by Mr. Hammack in the Registrars Office, the frequency and fatality of lung diseases were in the constant ratio of the space allotted to each person. The less the air space the greater was the amount of lung disease, the greater the air space the less was the amount of lung disease.*

It is the habitual respiration of air not prerespired that, under physical conditions in other respects the antitheses of each other, brings security alike to the sandborne Bedouin and the dweller in the moist and misty Hebrides. Nature when unopposed employs every imaginable precaution to guard the species from respiring afresh air exhaled from living lungs. By the formation and slanting direction of the nasal outlets she divaricates the breath as it issues from the nostrils,† as by

* Mapother, *Lectures on Public Health*, p. 17.

† On some Actions performed by voluntary muscles which by habit become involuntary. *Illustrans commoda vitae.* Lucretius. Osborne, *Dublin Medical Quarterly*, Vol. xxx., p. 288.

the force of expiration and elevation of the temperature she provides for its further dismissal from the mouth and, if suffered, final dispersion in the practically boundless ocean of the atmosphere. But where the breath, debarred of free outlet, is cooled on walls and ceilings, it descends and is again and again breathed, poisoning the blood and bearing ruin throughout the organism. With the abatement of the vital energies, the economy for a brief space appears to become habituated to scanty air supplies. Thus, birds perish at once when plunged into an atmosphere which other birds have deteriorated, and in which they yet survive a little. So, persons withdrawn from active employments, sicken in the foul medium surcharged with the effete organic waste which their companions in misery, seasoned to it from the first, sustain somewhat longer. The fetid nitrogenous matters, given off from the lungs skin and even the intestinal canal, have been estimated by Parkes* to amount to thirty grains per diem for each adult. How offensive, how deleterious, then, must such matters, when suffered to accumulate, and attach themselves permanently to clothes and persons and furniture, prove. As Snow has shown, it is not only the exspired carbonic acid but the withdrawal of a corresponding amount of oxygen which those so unfortunate as to be exposed to it, have to put up with If the blood in respiration appropriate from twenty to twenty-five per cent of pure inbreathed oxygen, what must be the result when the oxygen supply is not only diminished but habitually replaced by rebreathed air. I affirm that it is death, death sooner or later from tubercle, and I would challenge the entire body of detractors objectors and opponents to prove wherein I err. The aircells number countless millions, their area far exceeds the collective surface of the body, how should it be possible then for any evil miasm to be long applied to such a surface, and that surface incessantly communicating with the blood, with impunity. For although pure carbonic acid as derived from exterior sources prove instant death to man and brute, still the organism can sustain a larger dose of

* *Practical Hygiene*, p. 72.

it, much diluted, than when the carbonic acid is furnished by the respiratory act, itself, and mingled with other effete and in fact poisonous elements.*

The educated classes are now aware of the uses of the bath, and concede that as to their persons and environment it is a duty to be clean, but as to the importance of unbreathed that is to say clean air, they are unhappily yet as ignorant as the most ignorant. That they are so let the sallow pallid countenances, the worn out organisms, with the dreadful prevalence of consumption and scrofula, declare. It would be wrong to condemn wantonly a brute to respire a fouled atmosphere, how much more, then, a human being,† how much more a helpless dependent infant.

What misery, what tortures, what anguish, with what tubercle induced foot and ankle, hand and wrist, shoulder and elbow, knee and hip and spine disease, all, coupled with evils infinite, varied endlessly, might I not recount as springing from rebreathed air, air fouled by passing through mans vitals and not sufficiently expelled from his abode. And, yet, the Spirit and the Kingdom of God which pervade all things,‡ and subsist in their infinite perfection and goodness and purity about us, invite incite entreat us not to rottenness and decay, but to a most divine perfection and excellence, a perfection and an excellence utterly and ineradicably opposed to tubercle and all its evil train. It was but an afternoon or two ago that I was asked to visit a pallid anxious looking child but some three or four years old, labouring under tubercular synovitis. His knee, enormously swollen and much inflamed, was seamed with distended blue veins. Intelligent beyond his years, the

* Het Koolstofzuurgas moet als een der meest algemeen voorkommende schadelijke luchtsoorten worden beschouwd. Van Hasselt, *Vergiftleer*, Tweede Hoofdstuk, Te Utrecht, p. 218.

† Ich halte es für physiologisch ungerechtfertigt einen Menschen oder ein Thier in ein kleines stagnirendes Luftvolumen zu bringen, das nicht in seiner Ganzheit wechselt, dem man etwa nur dem verzehrten Sauerstoff zuführt und einen Theil der gebildeten Kohlensäure entzieht. Pettenköfer, Ueber die Respiration, Wöhler, Liebig, und Kopp, *Annalen der Chemie*, II Supplement band I, Heft, Leipzig 1862.

‡ Die Gottheit die alles durchdringt. Goethe, *Werke*, Stuttgart u. Tub. 1837, B. II., p. 87.

sad intelligence begotten of suffering, he was racked with burning hectic and unremitted restlessness. He gazed so wistfully at me with his poor beseeching eyes, at me who could yield him no relief, effect no cure. Ah, said he, as I gently touched the stricken limb, you will not hurt me, sure you will not. Even amputation, so far advanced was the malady, could no longer prove of any avail.

It is now long years since I went to visit a girl of barely fourteen. She was lying in an airless stagnant hole, in the hot month of August, consumed by hectic, worried by ravening flies. Oh, how she did writhe and twist and turn and suffer. I forced open the previously stationary casement, afforded such relief as it lay within my power to yield. But quickly, all too quickly, the dust of death had settled on her gentle features, and films obscured the eyes that vainly tried to beam a last farewell. Never shall I forget the case of a scholar and a gentleman whose life Potts caries of the spine, so named at a time when the real nature of the malady was unknown, wore with such protracted anguish, such suffering, so many sleepless nights and weary days, so slowly, ah so slowly, away. It may be a summer or two since I was hurriedly besought to visit a sick girl in an adjoining watering place. Already, however, she was in the last agony, and expired even as I gazed. I looked in some time after. Her features, of angelic beauty, were composed and still. She had missed some little appointment as national school teacher, so she opened school in a space circumscribed in the extreme, where for some miserable pittance she taught all day without cessation, sleeping by night in a garret without light or air, for there was no sky-light, save the little which the trap by which she gained access might possibly supply. Venom the most concentrated could hardly have proved more fatal. In this fell environment, bereft of the very honey and dew of existence, this poor young thing thus exhaled her sad brief life away.

It is no ordinary infliction which the sufferer from tubercle has to encounter. In verity it is a sort of living death. A youth whom I had known from infancy went in perfect health

to some sectarian school nigh Dublin and returned home, so well had they arranged it, but to die. It might have been an hour before his decease when for the last time I felt his pulseless wrist. Already, the lower limbs were motionless and cold. And, yet, in the very face and presence of destruction he conversed with all the sweetness and serenity that had characterised him in health. Two young people, brother and sister, took ill in succession of phthisis, and died, so, with smiles and blessings on their lips for my attentions to them. They had, so to speak, been put to death by their truly loving mother, who had sent them to sleep in chambers filled with irrespirable air. I saved, as I have done by many others, the lives of the re-remaining members of the same family by inducing them, after many instances, to sleep with open instead of closed windows. A young lad, too, whom I had tended, I came to lose sight of for a couple of years, owing to removal and the death of parents. But one evening he sent for me from the bed from which he never rose, labouring, oh dire infliction, under tubercle of the lungs and mesentery and trachea, all at one and the same time. Ah, how often have I seen the phthisical father and mother gaze wistfully, while they had eyes to see, on the infants from whom they were so soon to part, for ever. This, said a young lawyer of great goodness and intelligence in his last moments, the goal to which phthisis had led him, this is death, this must be death, this can be nothing else than death, and so then and there expired.

Oftentimes, oftener indeed than otherwise, tubercle invades several structures at once, as the lungs and spine, the lungs and mesenteric glands, the lungs and one or more joints, the lungs and larynx. Thus, two sisters whom I had long known, were wont to exclude every breath of air. They listed the doors, they pasted up the windows, it was a miracle how they survived. The elder sister, poor uncomplaining sufferer, died first. Her lungs, both of them, and other organs as well, were mere masses of tubercle. The other sister, truly patient and long enduring, experienced tubercle variously, and cancer of the breast, likewise, on her path to the tomb. In a young Scottish girl of infinite loveliness, brought to me when far

advanced in decline, hardly a shred of the lung structures subsisted free from tubercle. It is impossible to describe the state of utter rottenness into which, on examination after death, I found they had lapsed. I once went to see a family of four beautiful girls at their country seat. It was a most piteous spectacle, for they were all in different degrees tuberculous, and they all died.

From 1848 to 1854, inclusive, consumption cut off upwards of three hundred and fifty thousand persons in England and Wales. If Scotland be reckoned, it would be four hundred, and if Ireland were included it would amount to five hundred thousand souls, all perishing of what with my strongest firmest convictions I assert to be an entirely preventible disease. In the Royal Navy one man in seventeen is sick constantly, so that within three years three hundred and forty of the Queens mariners died, while six thousand were invalided because of phthisis, of which doubtless these should all perish. How can it well be otherwise. Consider the accommodation for the crews on board ships, and perhaps worst of any, iron warships. It is only a marvel that all are not destroyed utterly.

The Russians, by a refinement of brutality, when they do not at once consign their hapless prisoners to Siberia or the scaffold, confine them in filthy airless cells where tubercle soon brings the sufferer to his end. Such, too, was the case during the execrable rule at Naples. The influence of prison life, observes Dr. Baly,* is such, that nigh half the deaths in Millbank Penitentiary and half the pardons, on medical grounds, were due to tubercle. The mortality was four times as great as in the contiguous city. And yet the situation, for I visited it, was otherwise excellent. In the badly ventilated military prison of Leopoldstadt in Vienna, between 1834 and 1847, there died three hundred and seventyeight prisoners out of four thousand two hundred and eighty. Of these two hundred and twenty or eighty in the thousand, died of phthisis.† These men, then, were as truly destroyed by the authorities, heedless or ignorant of the unspeakable value of unprebreathed air, as if they had been dosed with sublimate or cast, millstones round their necks, into the deep sea.

* Phillips, *On Scrofula*, Appendix.

† Parkes, *Hygiene*, p. 91.

Most truly did Carmichael* ascribe the ravages of scrofula among the innocents in the Dublin House of Industry, to the respiration of an infamously impure atmosphere, along with the absence of open air life and liberty. In this truly infernal den, where they were left in the charge of an old woman, one hundred and fiftytwo children slept four in one bed. The windows were never opened. The air in the mornings was frightful. The children were also confined all day long in the ward which they had occupied by night. But it is so, likewise, elsewhere.† Duncan states, in respect of the mortality in the Dublin workhouses, that after death tubercle always presented itself in some portion or other of the organism. Griffin, indeed, detected it in fiftyfive per cent of the child inmates of the Limerick Union. And Dr. Althaus assured me, during the conversation which ensued after I had read my paper, *On the Preventibility of Consumption,* before the London Medical Society, that Rokitansky stated to him, and, you know, he added, Rokitansky has made more *post mortem* examinations than perhaps any other man in Europe, that he had invariably discovered tubercle more or less in every case. The lungs might be exempt, generally, but so soon as the scalpel penetrated the apex, there, tubercle was sure to be disclosed.

Willis‡ describes rooms in Dublin not fifteen feet square in which a dozen human beings, men women and children, were crowded, eating drinking sleeping dying, together. I visited chambers in Dublin, said a charitable person to me one day, where there was a family in each corner, the boundary lines being marked out by chalk. How do you get on, said my informant to one of the roomholders. We should do pretty well, said the uncomplaining creature, if only that lady, nodding as she spoke towards a neighbour, did not take in lodgers. I went once to see a sick person in a room in Belfast where I saw six beds occupied by eighteen inmates, nightly. I mounted by a crazy ladder into a windowless airless garret, in the same town, where I found three young persons in one

* *Essay on Scrofula,* p. 63.

† Arnott, *Condition of Children in the Cork Workhouse.* Malcolm, *Sanitar State of Belfast.*

‡ *Sanitary State of Dublin.*

bed, at the time, all ill of spotted typhus. The smell was like that of mice only much worse. Such an environment, such an atmosphere. I visited another dwelling, now happily no more, where actually nine persons, all of one family, too, laboured under maculated typhus. When I pass the dismantled ruin, that scene of desolation, with those nine sufferers, their fevered hands and burning countenances, seems to rise before me.

In some, alas many European capitals, the amount of tubercular disease is very great. In Berlin it rose to fiftysix, and in Munich actually to seventyfive per cent of the children examined.* Retzius has testified to its frequency in Stockholm. In beautiful Greece scrofula is only too common. Boudet, in a recent French journal, positively asserts that five Parisians out of seven are tubercle stricken. While Leclerc states that one soldier out of every three in French military hospitals is tuberculous. How indeed can it well be otherwise in a country where people sleep in alcoved beds with perhaps drawn curtains, and, almost certainly, with closed doors and windows.

Consider for a moment the economy of a poor mans household, his sordid surroundings, his perhaps intemperate habits, his wife himself and his eight children all occupying a couple of sorry ill ventilated rooms.† Wretched house accommodation, evil habits, and closed windows by night, in truth, doom multitudes everywhere to destruction ere their time. A bad like a good habit becomes second nature, and like the fabled shirt of Nessus ruins the unhappy wearer. Many times windows are not made to pull down, and even when made to pull down, still they are not pulled down. In rural districts else naturally healthy, we find from Headlam Greenhows researches, that the mortality from phthisis, by reason I assert of the infamous deficiency in house ventilation, is often greater than in otherwise the most unhealthy town districts. Speaking of certain workshops, he observes.‡ Gas is consumed in quantities, the space is very inadequate and rendered still more so

* Phillips, *On Scrofula*, p. 180. † Frazer, *Magazine*, Vol. l., p. 287.

‡ Childrens Employment Commission, 3d. *Report*, London 1864, p. 14.

by the closure of every aperture for the admission of air. A hovel with clean straw and open windows, is indeed preferable to a down bed in a palace with closed ones. When I visited the Duke of Northumberlands house in the Strand, the satin paneled rooms were gorgeous with pictures and silken hangings, the marble stair was exquisite, but there were double casements and the air was execrable. In the dwelling of a certain nobleman in one of the midland counties, large rooms with ceilings at least sixteen feet high, looked out on a grassy windswept park. But the air of those rooms, default of ventilation, was stagnant and unbreathable, utterly. I was sorry but not surprised when I learned that a daughter of the house, a young girl of only sixteen, had been carried off by decline. Her brother, whom I met, looked delicate. He only preserved life by fleeing from his sickly home, sickly not owing to natures autonomy but through the handiwork of man.

Russians Swedes Norse Danes Germans, adopt double casements, close stove heated rooms, and of course scrofula and consumption along with them. The habitual atmosphere of such rooms is bad, necessarily, but it is aggravated, in the period of the thaws when the frozen impurities begin to melt. And yet noisome chambers and tuberculous disease might severally be avoided by strict cleanliness, open fires and windows, and ventilating stoves. Any wholesome hardship or poverty were surely preferable to disease allied with whatever wealth. For, after all, health is true riches, and what is life apart from those perfect stamina which an undepraved atmosphere can alone realise. The sweetest perfume is that yielded by a perfectly renewed atmosphere. In the case of air offensive to the senses, nature challenges attention and enforces so to speak the remedy. But rebreathed air may subsist to an extent ruinous to health, yet not prove necessarily offensive. Here, reason must supplement the senses. Hence it is that persons in easy circumstances who breathe prebreathed air, all unaware of the fatal results, are annually swept away in great numbers, in these islands, by consumption.* We pollute Gods atmosphere

* Mac Cormac, *Connexion of Atmospheric Impurity with Disease*, read before the Statistical Section of the British Association, Session xxii.

with our breath then breathe it again and again till we die.* So many as fifty per cent of the men, and seventyfive per cent of the women dying at Morningside Asylum, were ascertained by Dr. Clouston† to labour under deposits of tubercle. Without adequate ventilation, the air of asylums schools barracks workhouses reformatories prisons penitentiaries, tailors and other workshops, dressmakers rooms, churches lodging houses, courts of law, lecture and debating rooms, nurseries, but above all bedrooms, is liable to pass oftener than once through the lungs of the inmates.‡ Two thirds of the military mortality in the United Kingdom, and it is or was approximately, if not actually, as great in Germany France and the Low Countries, accrued from pulmonary, that is to say in the very great majority of instances, tubercular disease. It caused, and indeed causes, more numerous admissions into hospitals than do both bowel complaints and fever, and thrice as many deaths. Within the last year or two, through the wise instrumentality of Dr. Sutherland as sanitary commissioner, considerable improvements have been effected, and barrack rooms and hospital wards, as I myself have witnessed, have to a certain extent been ventilated. But no ventilation can be looked upon as adequate or effective that does not provide for an immediate and most thorough interchange with the outer atmosphere. Among the opulent, the female portion especially, the constant tendency is to indoor life, passivity, and unwarranted, because not justified by prior effort, repose. Nothing can replace systematised out door life and action, the open casement by night, the daily bath tepid if you choose, the morning walk and air. What if the searching air by night prove on admission cool, and what if the morning atmosphere on first plunging into it, the wetted towel or the cleansing water in which we daily thrust our feet, feel for an instant chill, vigorous dry rubbing and prompt reaction restore the balance, while the ineffable sense of a living cleanliness and purity completes our satisfaction and constitutes its own exceeding recompense.

* Duncan, *On the High Rate of Mortality in Liverpool.*

† *Journal of Mental Science*, No.xlv.

‡ Thompson, *Report on the Breathing space in Marylebone Workhouse.*

The perfection of savage life, about which so much has been said, accrues when witnessed, from instinctive adhesion to natures rules. And, yet, reflection and experience, were they so applied, are capable of realising a yet loftier ideal than what perhaps subsists in any so termed natural community. Every evil, the German proverb has it,* entails exactest retribution. Certain it is that material mismanagement is invariably followed by some corrective, or if the evil prove too great, by destruction absolute. The barbarians, as we call them, that so often overran the more civilised, yet in many ways degraded portions of the ancient world, would have been driven back like thistledown before the wind, had only strenuous effort and wholesome energies habitually ruled. These barbaric incursions, after all, were natures severe though in the long run wholesome correctives, and such indeed she administers ceaselessly.

It is now some two hundred years since Harvey conversing with Greaves, the traveller, though all unaware of biological chemistry, sagaciously remarked that he did not see how a number of persons could converse whole hours in the central chamber of the great Pyramid unless there were some interior tunnel ventilation, and such indeed has since been proved to subsist. But a like necessity for ventilation exists wherever living beings house. We never actually do breathe, twice, the same portion of the same air, the *succus alibilis* of it, as wise Harvey said, being spent. In nature, at any rate, we do not. But during civilised indoor life we respire, oftener than otherwise, at least a portion of the same air many times. And the fact is too surely proven by progressive tubercular degeneration, hectic, and death, in those who so respire it. It is no mere matter of election. Nature, that is to say God, has so constituted us that a single respiration is the measure of the vital capacity of the same air. For the same air, any portion of it, once breathed, may not unpurified be breathed again. Rebreathed air then is simply death, sooner or later, death.

The pulses or puffs of air that come in ceaselessly, winter

* Alle Schuld racht sich auf Erden.

and summer, through open windows by night, inspire, just as if one slept in the very open air, a sort of ecstasy. Gush follows gush, full of all delightfulness, replacing the used up air, and purifying the blood. It has oftentimes been said to me, I open the window the moment I get out of bed. To this I have uniformly replied. The moment to open the window is when you get into bed, not when you get out of it. You cannot otherwise with entire certainty secure the benefit of an ever ceaselessly renewed night air, so all essential to the bloods renewal and the maintenance of health. As the air we inspire, were it the very coldest air, furnishes our entire animal warmth, we need not fear, proper coverings being only supplied, to inhale it. Besides, but a little portion, a portion not larger, at most than an apple or the clenched hand, is taken in at a breath, and conveyed to the ultimate air vesicles of the lungs. And even that little, exclusive of being heated during its transit, is mixed with a residuary mass, at the temperature of 100° F. many times its amount. The air at night, indeed all air whether within doors or without, is night air. But the air admitted at the open window top is pure night air, air not prebreathed, air that renovates and recruits, air that brings life not death, air that will surely prevent, but which is quite incapable of causing, consumption while earth and man endure. But closed room night air, night air which no air from open window tops or otherwise renews, in a word stagnant night air, effete night air, prebreathed night air, that is the only night air which we are to abhor, that is the night air which no breathing creature can inhale and securely live. It is literally the venom and distilment of death. It is the one, the only promoter of consumption and of scrofula. It is the sure and certain source of wasting sickness and blasting decay.

Sir, said a half distracted creature to me, this very day, what am I to do. My husband, sisters, brothers, have all died or are dying of consumption. These were her very words. Alas, such words are too often doomed to fall on medical mens ears. I was consulted recently in respect of two young girls, one of whom had been to school at Everton, the other at Birkenhead, both of whom assured me, not in concert for they

did not know each other, that an hour daily was the utmost period of open air life and recreation that was allowed them. Yet, girls need romping, skipping, running, racing, after their fashion, do they not, quite as much and as often as boys need them. They need meat and wine, too, do they not, and good wholesome wholemeal bread, with fruit and vegetables at discretion, strong out of door shoes, and warm coverings, generally, just as do the opposite sex. Nature, during the so exacting period of growing youth demands amplest sustenance,* abundant light† and air, with the fullest measure of outdoor life and action along with them, and will not with impunity be denied. Girls meals, breakfast and the midday meal, should be quite as substantial as those of boys. If nature be robbed or thwarted or cheated in any important respect, she will levy exactest retribution, will deal out hypochondriasis debility constipation amenorrhoea leucorrhoea and, finally, and worst of all, tubercle.

Yesterday, a young person was brought to me, so still and quiet was she, it seemed evidently the habit of her poor life, that no murmur of respiration could be heard. Ah, it was an ominous stillness, a stillness ominous of death and the grave. Another young person who laboured under obstinate school engendered amenorrhea and constipation, told me that at her fashionable Dublin boarding school she was allowed but a single blanket at night, whereas she ought to have had at least a couple pair, fleecy and warm, with rug or eider down coverings, coupled with open windows and doors, besides. Of what avail, I should like to ask, are accomplishments and deportment that only conduct to the grave.

If one could but flit from workshop to workshop, and from school to school, what dietetic and regiminal abuses might one not rectify, what teachers and employers might one not scare, how many young hearts might one not rejoice, and above all, what consumption, what scrofula, might not one avert and drive

* Debitam cibi et potus quantitatem ultra vel citra quam laedimur. *Sanctorii Aphorismi*, Lug. Bat. 1713.

† La lumière solaire agit sur les êtres organisés en accélérant leurs réactions intraviscérales qu' elle vivifie. Mialhe, *Chimie Appliquée à la Physiologie et à la Thérapeutique*, p. 579.

away. There was among others, a little boy in a printing room who worked long hours daily at case, and then went home to sleep in a narrow airless den. He was so intelligent, so sweet a boy. But tubercle had pierced his brain. A couple of days after last speaking to him, he called out, my head my head, and then forthwith expired. A lively and perfectly healthy young girl whom I had known, and when needful attended from early childhood, was sent to a certain town of schools in Berkshire. Her breakfast, there, was some thin bread and butter and a cup of tea, then lessons on lessons, with airless rooms, no exercise, and at night shut up bed chambers and closed windows. Not satisfied however with this, the people of the school, under colour, doubtless most sincere but infinitely mistaken, of contributing to some distant mission, induced the poor things in their charge to omit a slice of their food, scanty as it otherwise was, at every meal. My young friend, in whom I was deeply interested, had repaired to this do the girls hall exuberant in life and spirits, but left it a little within the year, silent sad and pale, all her gay prattle stilled, her feet and hands white as marble and as cold, with long persistent amenorrhoea, tuberculous in every lung. Nothing could stay the progress of her decline, and now, poor dear, she rests quietly enough beneath the churchyard stone. Another patient, such are the oft recurring items of a medical practitioners experience, took leave of life with truly angelic patience and serenity, and, notwithstanding incessant suffering, got up and attired herself to the very day of her decease. This victim of indoor life, curtained beds, and never changed air, used to gaze so wistfully at her little ones whom she was careful to send out to walk and play. And, yet, there was another, would to God that I could but cite them all, who, in the very article of death clasped my fingers in her trembling hands and thanked me so, I who could do little better than gaze as she lingered and perished of decline, for what she was pleased to term my goodness and kindness during her disease.

Surely, we have sacrificed victims enough to Moloch in the shape of unwholesome living and prebreathed air. Does God supply us with uncontaminated air, and by his sure law declare

that we shall breathe no other, if he do not mean that we should use it summer and winter, day and night, and always. It will be conceded, I suppose, even by the most ignorant, that the organic law, the law of life, indeed the divine law, is not intended to be disobeyed, and the rule of death, or disobedience to the organic the divine law, substituted in its stead. The call for vigorous unimpaired action of the lungs and diaphragm, coupled with the respiration of air no part of which is prebreathed, is peremptory in the extreme. Go where you will, ignorance prejudice and apathy ride rampant over mans destinies. Pass through and across any of our large cities at early dawn, and you shall not, perchance, find a single window open throughout. No wonder the inmates are tubercle ridden, eaten up with disease and decay. Consider only the general aspect of the inhabitants of these mountain masses of brick and stone, their pallid weedy half developed offspring, too often sickening perishing like the insects on the wall.

Within the space of some sixty seconds or less, the blood sweeps through the organism gathering up impurities and, when sweet and pure, renovating the entire economy of man. Those impurities need instant incessant discharge. How undesirable must prove the state of things, how disastrous, when these impurities are long retained. Yet, question the first mother you meet, ask that decorous intelligent matron, what pure air, unbreathed air, air by night, is designed for if not to be admitted in full and overflowing measure into the chambers of her little ones. Ask her if indeed nature have not created a relation, a consensus the most perfect, between mans lungs and the untainted outer atmosphere. She will gaze incredulously, perhaps shudder a little, as I have known some to do, then inquire if you really mean that night air, that is to say pure sweet unadulterated air, is to be afforded admission by night. And, yet, most mothers have medical friends and advisers whose duty it should be, should it not, to counsel the fullest freest admission of a pure night atmosphere. Alas, these medical advisers not seldom need advice themselves. Ah, how many doctors and doctors wives and children are there who

labour under tubercle and tubercle induced maladies. If each mother but felt, knew, how fatally and how frequently, tubercle, irreversible inexorable tubercle, seized on the vitals of children, how earnestly how fervently would she work and pray for exemption.* What mother, I ask, would look calmly on while some venemous reptile or ravening beast, whether slowly creeping or quickly bounding, approached with fell intent. Yet, no reptile, no beast of prey, within the compass of its evil influence, is fraught with the insidious destructiveness of prebreathed air.

A year or two back I paused some days at Rouen in order to enable my youngest daughter to inspect the queer old houses set like gigantic oaken cabinets in the wall, and the spot where hapless Joan of fighting memory was burnt by our chivalrous ancestors. The landlady must have thought me perverse, indeed, for I would neither occupy my allotted chamber nor permit my daughter to occupy hers until the casements, severally, had been opened as they had never been opened before. And yet it was summer and the weather was warm. And so all night through a whispering breeze from green Norman hills, blended with the delicious voices of birds, came singing through the apartment. I asked the sharp landlady to allow her somewhat delicate looking little girl, home from her pension, to enjoy likewise an open window. *Comment, Monsieur,* she said, *mais ça gâte les yeux,* and nothing that I could allege, though I took care to ask her how many eyes she had known thus destroyed, served in the very least to shake her insane resolve.

During the recent London Exhibition I lived with my family for a week or two in Belgravia, and yet even in this reputable quarter the windows had never been made to come down. It would pull the house to pieces, the people said, to alter them. I persisted, however, and it was done. And, ah, how refreshing it proved during those sultry summer nights to lie in the open draughtway. Incredible, nay unspeakable, would prove

* Les médecins qui ont suivis longtemps les services consacrés aux enfans à la mamelle savent que la plus grande nombre de ces petits malades succombent à des affections tuberculeuses de la poitrine. Trousseau, *Clinique Médicale de l'Hôtel Dieu de Paris* 1861. Tome Premier, p. 575.

the amendment in the health and stamina of Londoners if only every window in the immense metropolis, ἡ πόλις ἡ μεγάλη, were made to open, and were opened, nightly, as I opened mine. Somewhere in the year 2,000 the thing perchance may be done. Then, armies, armed not with the implements of destruction but those of science and art, shall march in the dear interests of humanity from land to land and from town to town, and the dirt stained, scrofula devoured, consumption infested, pallid weakly anxious throngs, now mere food for death, which haunt to overflowing every city, and no city more than London, shall perchance be seen no more.

Gott im Himmel, exclaimed a German governess whose window had been left open by one of my young people, I have slept with my window open, and, yet, giving herself a little incredulous shake, I do not think I am much the worse. Already, had this young person oftener than once herself, experienced hemoptysis, as also had one sister, while a brother perished of phthisis in the airless precincts of their German home. And now these sisters, one in Germany the other in England, sleep habitually with open windows. One has become a wife and mother, the other remains unmarried, but both enjoy uninterrupted health.

I wrote to ask the excellent master, when my son went to Queenwood College, to permit his windows to remain open at night. Certainly not, was the reply, and so the upland Hampshire breezes vainly wooed the casements for access to the panting lungs within. My son afterwards proceeded to Germany well and duly impressed with the importance of renewed night air. The folding casements, both of them, of his sleeping room he kept widely open, the winter through, to the perfect horror of the good German parents whose son had perished of closed windows in the very chamber which my boy occupied. Night after night the contents of the water jug, he told me, were frozen. Yet, never did he experience a chill, never took what is vulgarly termed a cold. The dear lad then removed to the Rue Caumartin in Paris, where chamber ventilation was a thing unknown, and when by him proposed rejected utterly. The boys in the roomy *dortoir* where my son

lay, raved and talked so in their sleep. And, oh, to think of excluding fresh air from a dormitary during the hot nights of summer, or indeed any nights, in such a place as Paris. No wonder that France is tubercle ridden, for nowhere in that country, I believe, are windows opened by night. No wonder that England is so, for there, everywhere, however cleanly otherwise, the evil practice of closed windows, by night, prevails. Fortunately for himself, my sons couch was placed beside one of the large casements, and when the others slept, he got up and undid the espagnolette bolt, and so admitted unchallenged a somewhat of the outer atmosphere. At home, he now sleeps on a low bed, as we all do, with, year in and year out, both door and window widely open. Any one who should enter our chambers, however fine his perceptions, would be unable I believe to detect the slightest difference, a trifling elevation of temperature perhaps excepted, between the air of those chambers and the atmosphere on the next hill top.

When at school in Paris it was only by engaging a chamber for their exclusive use, overlooking the vines and the flowers, that the really intelligent principals would suffer my girls to keep their windows, they were the usual French casements, open. Look father, they said, when I afterwards went to visit them, as they pointed out their little arrangements and showed me the large garden outside, here the sweetest air circles all night through, and when the early morning dawns, it brings with it the song of birds and the perfume of many flowers. I suppose this was the only girls sleeping chamber in Paris, very probably in all France, where two French windows were kept widely open, winter and summer, the whole night through. I was sorry, when I looked at the other young people, and tried hard to obtain for them a similar boon. I might just as well, I found, have addressed the trees in the garden or the stones in the wall. And, yet, during hot weather and cold, winter and summer, alike, the already breathed air should be suffered to escape and air not prebreathed at all admitted in its stead. Reasonable precautions, that is to say adequate night coverings, being resorted to no colour of risk, even to lungs the most delicate, can possibly

ensue. For it is stagnant air, air prebreathed, only, and not pure unpreresperired air, that makes lungs delicate.

In America they suffer frightfully from hygienic mismanagement. The many eat too quickly, drink too much, smoke too often and too long. They are at one time too indolent at another too busy to live sufficiently out of doors, and everywhere the windows are nightly closed. Each woman, observes an American practitioner,* speaking of his countrywomen, should walk four miles daily. But in summer they do not walk because it is too hot, and in winter they do not walk because it is too cold, and so stoveheated rooms at one time and unventilated rooms at all times, complete the mischief. Such shallowbreasted, bent, fragile creatures as are to be met with, I think I never beheld elsewhere. How, indeed, can children be strong or men robust, if mothers be ever weak and ailing. Every project of pleasure or enterprize in America, says Miss Martineau † in memorable words, is marred by ill health. The ravages of consumption, indeed, are simply terrific. And, yet, the climate, if people would but adapt themselves to it is in many respects lovely, and the air, for I was about at all hours, commonly of celestial sweetness and purity. The Indians, some thousands of whom I met on the shores of the great lakes, as well as elsewhere, were magnificent. The young men were straight as their own rustling pines, they had the gait of the bounding deer. The women, many nay most of them, were exquisitely formed. Such full deep bosoms, spreading haunches, teeth of pearl, and eyes of softness, were theirs, such hair, too, and, ah, such a gentle winning mien. Bad teeth, dyspepsia, foul breath, scrofula or consumption, may have subsisted among them, but if so I saw it not.

It was in respect of this same country of America that a merchant, a delicate phthisical person, calling one day to consult me, said, I am going to the States, Doctor, in the way of my business, and shall have to remain in New York for some time in the very depth of winter. What would you have me do. You have always recommended me to sleep with open

* Meigs, *Diseases of Women and Children*, Philadelphia. † *Travels.*

windows, here, would you likewise advise me to do so there. Assuredly, I replied, unless you should be prepared to show that pure unbreathed air is not as requisite in America as in Europe, in winter as in summer. Only take care that you go warmly to bed, and that you have an ample provision of fleecy night coverings. He went, and after the lapse of some months, a comparatively hale and vigorous man, he again presented himself. You know the Park, he went on to state. Every one knows the Park. Well, my windows, and they were French ones, overlooked the Park. I threw them both open when I retired. The keen midnight air came in as it listed. I never was indisposed, never felt or caught cold, in short never was a day from business. And when I left my cool though pleasant chamber for the stoveheated body of the house, to breakfast, it was like going into an oven.

Europe and America are harassed alike with tubercle. Yet, it needs but conformity to natures precepts, the avoidance here and there of twice breathed air, to evade this scourge. Let the Russian if he will not abandon his ponderous stove, but admit the untainted air while he sleeps, though it should come to him from icy tundra or snowy waste, and straightway the scrofulous demon which haunts him now will infest him no more. Wherever God makes man, it were a blasphemy to esteem it otherwise, he there provides the conditions of amplest health. The atmosphere as it is, and not otherwise, is lifes very elixir, both in health and disease. The Laplanders go to sleep in the snow blessing heaven for the soft and tender couch. Nay, Von Wrangel* mentions that the people on the shores of the Asiatic Polar ocean, not to recal Back Franklin Kane and MacClintocks experience, sleep with perfect safety on the ice bound soil. Mrs. Jameson† describes Indian girls reposing by night on the fragrant pine boughs with only a deerskin between them and the starry heaven. It is well known indeed that people who camp in the wilderness, settlers woodcutters and others, young and old, sleep in winters very depths, secure of impunity, in open shanties or in the open air.

* *Travels to the Shores of the Polar Ocean.* Sabines tr. † *Travels in America.*

Two of Mrs. —— sisters had been cut off by phthisis. The first of these I saw only once or twice, but the life of the second I managed to protract, with many alleviations, in the face of great suffering. The family and connexions had been severely scourged by consumption, and now the third sister was attacked as her deceased sisters had been. She experienced repeated hemoptysis along with a harassing cough, as was likewise the case with her niece, just stepping into early womanhood. Mrs. —— felt naturally much depressed, most unwilling to part with her little ones and the sunny world around. I began the treatment by insisting on a very generous regimen. I fortified her digestion, gave various forms of steel, and finally sent her carefully and warmly attired to a windswept strand. I further enjoined her to live, so to speak, on horseback, in fact, to pass every day and all day long, out of doors. All this, however, would not have availed without open windows and unprebreathed night air. But when I came to recommend this, Mrs. —— I found was afraid of robbers. She would keep her windows open, she said, but for that. I half reasoned, half laughed her out of her quite illusory dread. No robber, I told her, was half so bad as prebreathed air. A robber might purloin her jewels or her purse, but a prerespired atmosphere would surely steal both health and life away. It would grieve me so, I said, were she to experience the untimely fate of those dear ones who had preceded her. At last, she submitted, unconditionally, and persevered assiduously. The improvement was not at first rapid, but with some intermissions, it was mainly steady. We had a hard battle, for the malady had already gained strong foothold in lifes citadel, but we were successful at last. The incipient tubercle masses became doubtless in part absorbed and obsolescent. The enemy, so often victorious before, was now forced to succumb in turn. Mrs. —— and her young relative, when last I saw them, were in the enjoyment of robustest health, and, singular anticlimax, seem quite unaware of the mighty service which, happily for them, a clear insight and sound practice had undoubtedly proved the means of yielding.

Certain pathologists, unable to account for the prevalence of

tubercle and forgetful of the good old maxim of not asserting that a thing is its own cause, *non causa pro causa*, invoke a sort of *Deus ex machina*, and tell you that the malady is hereditary. The cause of that patients disease, they assure you, was with a grandfather. But as to its origin in a grandfather, their hypothesis is mute. Yet, nothing can prove more illusory, at least in regard of the instance in hand, than the doctrine of hereditary transmission, which has no more to say with the real working influence than the Cissoid of Diocles or the Witch of Agnesi. The alleged hereditariness of consumption and scrofula is not only false in itself, but further a most cruel and destructive crudity, since it prejudices a resort to the very the only remedies calculated to prevent or stay the malady. The ascription of consumption to hereditary influence is about as reasonable as to say water runs up hill, or that mens wits depend on the moon. It is one of those *post hoc propter hoc*, ὕστερον πρότερον, cart before horse, Tenterdon Steeple and Goodwin Sands arguments, half truth and whole lie, that has helped to baffle truth and truthseekers from the worlds beginning till now. Doubtless, constitution is transmissible. Strength will engender strength, and feebleness feebleness. But it is not a question of health or strength, do you not see, but of consumption, which assails equally both strong and weak. The very strongest and the very feeblest, the cause which I allege being at work, prove the common prey of tubercle. Your giant is as weak before prebreathed air as is the puniest dwarf. And, yet, notwithstanding all this, Clarke* asserts, and many assert along with him, that the hereditariness of tubercle is a fact not to be controverted. Prudent marriages it has been stated annul consumption.† But prudent marriages *per se* will do nothing of the sort, have nothing to say to the matter in hand. Scrofulism, alleges a recent writer,‡ is reproduced by parents in their children. Experience, affirms the otherwise judicious Fourcault,§ demonstrates that phthisis is transmissible. And, yet, transmission has as much

* *Cyclopedia of Practical Medicine.* Art. Tubercular Phthisis.
† Aitkin, *Practice of Medicine.*
‡ Bouchut, *Maladies des Nouveau Nés*, 4 ième Ed. Paris 1862.
§ *Maladies Chroniques*, p. 110.

to do with it as have the icebergs of either pole. To show the vagueness of our prepossessions on the subject of tubercle, I may mention that particles of stone dust, which indeed induce irritation, have been said to excite consumption powerfully. To potatoes and blankets it has been ascribed in the case of the New Zealanders, to tight lacing and stripping the chest nearer home. Moral influences say some,* have a most important tendency to produce consumption. A large part of the infant mortality from consumption is ascribed, with like irrelevancy,† to an insufficient milk and food supply.

The incessant life and action of early childhood, under any approach to favourable circumstances, exempt it mainly from tubercular infliction. But when these favourable circumstances are absent neither will tubercle, the childs life and action notwithstanding, remain absent.‡ In the Paris hospital for sick children, *although two fifths of those past two died of other maladies, still, Guersant, Lombard,§ and Papavoine, record the occurrence of tubercles in five sixths or nearly of the bodies of these hapless innocents.*

The bronchial glands are frequently and seriously implicated in childhood. Alison gives a striking instance of this in a boy only five years old. Bailey, Clarke, Cruveilhier, Bayle, all record excessive tuberculisation, and even extensive lung caverns, in children at very tender periods, nay, within the very first year of their age. Certainly, tubercle is most rare in the newborn, implying some hitherto undetected depuratory function on the part of the placenta, for pregnant mothers themselves are not exempt. Nature, or rather a divine providence, foreseeing the ravages of tubercle in our species, mercifully

* Duncan, *Dublin Medical Quarterly*, Nov. 1849, p. 269.

† Smith, British Association, Bath, September 1864.

‡ Même chez les enfants lorsque vous serez consultés pour un malade affecté d'un gros rhume avec fievre durant depuis longtemps, et que vous constaterez l'existence du souffle bronchique persistant opiniâtrément dans le même point pendant plus d'un mois, lorsque ce souffle sera accompagné de râles muqueux sous crépitants, et que vous serez assurés qui il n'est pas dû á la présence d'un épanchement pleurétique, resérvez vôtre diagnostic car il est à craindre que l'enfant ne soit túberculeux. Trousseau, *Clinique Médicale de L'Hôtel Dieu.* Phthisie Pulmonaire.

§ De L'Influence des Professions sur la Phthisie Pulmonaire, *Annales de l' Hygiène Publique*, An. 1834.

exempts the unborn infant by bestowing as I conceive on the placenta the power of straining the mothers blood from all trace of effete carbon, thereby, in the immense majority of instances, hindering its deposit as tubercle in the infants tissues. Thus, my theory alone explains the absence of tubercle in the fetus, while, conversely, the absence of tubercle in the fetus confirms my theory. Once, however, the infant comes to breathe, the conditions of its existence are quite altered, and it no longer unhappily enjoys immunity from tubercle.

Though Billard, Andral, Chaussier, Dupuis, Langstaff, and Hamont, all record congenital tubercle, many pathologists have never so much as met with a single instance. The excessive rarity of tubercle in the newborn is shown by the fact that Guizot failed to detect it once in four hundred newborn infants. Gluge,* and I myself, then, are everyway justified in asserting that there is no born scrofula or tubercle, occasional examples of the latter notwithstanding. When, therefore, we encounter the malady in after life, we are not to ascribe it to any fancied hereditary bias or inborn tendency, but simply and only to the respiration of prebreathed air, air deficient in oxygen and further loaded with watery and other foulnesses, cutaneous exhalations, in fine, the effete oxygen, effete hydrogen, and effete carbon of the organism. For one, nay half a per cent of carbonic acid gas, as derived from prior acts of respiration in the air we breathe, will hinder the bloods decarbonisation, tend to tubercle deposits, and prove ruinous to the entire health and stamina of man.

How exquisite is an infant, how impressionable, how susceptible to every influence for good or for ill, what a wondrous creation of the infinitely great and wise God. The blood, from his little heart, full of healthy nutriment or laden with carbonaceous and other inpurities, flashes as it were each several instant from the centre to the circumference, fills the multitudinous secernent capillaries and the tissues they build up, with balm and life or with death and bale. If we gaze but for a moment with the physiologists deep and searching glance at this amazing microcosm, we shall quickly appreciate

* *Atlas der Pathologischen Anatomie.*

the deep necessity there subsists for respiring the sweetest purest air, for cleanliness the most unremitted, for nourishment the most appropriate, warmth the most genial. And, yet, in spite of all a mothers instincts and loving care how sadly is the infant too often used, how inappropriate his food, what air, what dirt, what vilest drugs are thrust upon him. Thousands, nay tens of thousands, yearly perish owing to air prebreathed and foul, opiates, and even actual starvation. Instead of wholesome mothers milk, mere starches, with various names and mendacious attributions, deficient in the nitrogen, iron, magnesia, and phosphorus, so needful for the formation of healthy flesh and blood and bone and nerve, are substituted.

How simple natural and intelligible are the views here advocated, as contrasted with some others untenable in themselves and leaving the source of phthisis exactly where they found it. Until rational views as to the real origin of tubercle be adopted, no effective step can or will be taken to arrest the frightful mortality that accrues from a scourge that slays its multitudinous victims on the right hand and on the left, from tender infancy to decrepit age. Vainly I insist, *insistam forti mente*, if no one hearken. Reasoning is caviare to the majority. They want facts, such facts for example as is the ascription of tubercle to the potato,* just as if facts, real or alleged, had not to pass through the crucible of the judgment and reasoning powers, generally. And there is that other false fact, as held say by Forestus,† that phthisis is communicable. Indeed, Fracastorius went so far as to say that not only was phthisis communicable, but that the infection actually lurked for years in clothes bedding and furniture. In the course of a conversation which I held with the late Professor Alison, not long before his decease in his retreat at Colinton, near Edinburgh, even he alleged that he was inclined to believe that consumption was communicable, and instanced in proof the case of his wife, smitten, as he seemed to imagine, while in attendance on a phthisical mother. To this I ventured to rejoin that it was the close confinement and rebreathed air, not infection, that had to

* Corradi, *Bibliothéque Universelle de Geneve.*

† Contagiosa est φθοη.

do with his dear wifes malady. Lapelletier in France and Goodlad in England, both went so far as to inoculate with tuberculous matter. We cannot admit with Bouchut that such attempts will succeed ever, because tubercle is not ascribable to infection but to the respiration of already breathed air. ONLY BREATHE PREBREATHED AIR, AND SOONER OR LATER THE UNELIMINATED BECAUSE UNOXIDISED CARBONACEOUS WASTE WILL BE DEPOSITED AS TUBERCLE. DO NOT BREATHE PREBREATHED AIR, EVER, AND YOU SHALL NOT INCUR TUBERCLE, YOU OR YOURS, NO NOT THOUGH YOU SHOULD SURVIVE A THOUSAND YEARS.

The mortality owing to tubercle, portentous as it seems and is, does not include the deaths from tubercular laryngitis, *tabes mesenterica*, tubercular arthritis, hipjoint disease, tubercle of the bone, Potts caries of the spine, common scrofula, or those many instances in which tubercle though present is not the immediate cause of death.* No one, indeed, not even medical men themselves, unless those whose attention is specially directed to the subject, can well appreciate the perilous frequency of tubercular disease. This morning there called upon me, soliciting advice, a seamstress, a spinning girl, a carpenter, and a wood turner, poor sufferers, severally spitting blood and matter. They were preceded a day or two previously by other four, one with strumous arthritis of the knee, one with tubercle in the spine, a third with disease of the hipjoint, and the fourth with ordinary decline. Then, there followed quite an array of hacklers and others working in dust and fuz by day, and spending their nights in airless holes soon to be consigned, they and such as they, to inevitable doom. Lastly, a labourers wife, with her baby the survivor of twins, looked in. Sir, said the woman, will you tell me what my baby ails. I replied that it was dying through lack of air, for the faces of those who suffer from air famine soon reveal the fact. Did you cover its little cradle.† Sir, I did. I covered

* Il est certain qu' un nombre considerable de décés attribue a la bronchite, à la pneumonie chronique, au marasme ou atrophie, à la méningite, à la diarrhée, aux convulsions, doivent etre rapportés à leur cause réele savoir la presence des tubercules dans les poumons, les meninges, et l' abdomen, ou à la tuberculisation générale aigu.—*Bibliothéque Universelle de Geneve*, Tome xv., p. 385.

† On doit placer l' enfant de manière à ce que la bouche et le nez ne soient pas couverts, et le mettre dans un lieu ou circule un air libre et frais. Billard, *Maladies des Enfans*, 2 ième ed., p. 511.

it over with its quilt. I tried to impress this poor mother with the indescribable importance of air not prebreathed, showed her how her one babe had been undone owing to neglect, and how she was to manage, haply to preserve the other.

In a printers composing room where a treatise of mine was under press, the foreman printer, the foreman binder and his son all laboured under decline. Father and son these loved each other so, they were so happy in their useful toil. I gave them such remedies as I was then aware of, but one after another they perished. Three sisters too I knew, driven poor things by adversity to have recourse to their needle for which their antecedents had not well fitted them. However, they toiled hard all day long, and when the light began to fail went out for a mouthful of air, flitting about just like shadows on the wall. Presently, they ceased to go out at all, and then, briefly, two of them were no more. They perished, need I add, of phthisis. The third sister, more active than the rest, and purveyor for the little household, came to ask me if, seeing that she was quite alone, she might join her only brother in Africa. She went, indeed, and fever stricken she and he alike perished. I felt so sorry.

Just now, there occurs to my recollection two Irish farm houses severally seated in localities naturally the most salubrious. By one of them a green hill stretched heavenward, and beside the other stood an ancient rath that told the story of races that are gone. Air unimaginably sweet and pure, air perfumed by the meadowsweet the honeysuckle the bean-blossom and the rose, played around these farmhouses, but it was never suffered to get in. Tortuous passages, fusty low-ceiled bedrooms, frowsy sitting rooms, filled up each interior. The windows would not open, were never made to open. Now, mark well, within one short year three victims to phthisis were carried out of one house, while a handsome girl slain by the same fell malady, *morbus atrox, morbus atrocissimus,* was borne feet foremost from the other.

A retired doctor lived in a pleasant nook amid the lovely hill scenery that abounds to the South of Dublin. My dear

friend, he wrote to me to say, all my first family perished of consumption and, now, from signs and tokens with which I am only too familiar, I perceive with dismay that the dear children by my present wife, three daughters and a son, seem as if they should incur a like fate. I am in despair, and know not well what to do. They have every comfort, nor is there under heaven a healthier spot than where we dwell. I wrote to him what I thought he ought and ought not to do, and added that as he had often pressed me to go and see him I should set out at once. Shortly after, in effect, I found myself in my friends hospitable abode. Do you send your young people out of doors. I do, he replied. Have you opened their sleeping chamber windows. He replied, I have. Excuse me, I rejoined, for I knew the weakness of poor human nature, and as I really wish to serve you, permit me to inspect your arrangements with my own eyes. But my young people, he said, have retired to bed. So much the better, I exclaimed, I shall then know for certain. I would give the doctor no time to make preparations, but mounted the stairs out of hand along with him. The beds in truth were uncurtained, but the windows were opened barely half an inch. The blinds were also down, and the shutters were to, while the window curtains were drawn close. Do you call these open windows, I said. You have complied, my dear doctor, in terms but not in fact. And as, *de non apparentibus et de non existentibus eadem est ratio,* I must, I find, arrange matters myself. So, I drew back the curtains, opened the shutters, hoisted up the blinds, and pulled down each window, the poor doctor all the while holding out a deprecating arm. I then repaired to my own chamber where a French window on a balcony, exclusive of a sliding casement, yielded on being opened the freest access to the really heavenly air that was wafted from the Dublin mountains and Killiney Bay. Finally, my friend surrendered at discretion, and entered heartily into my views. And his family, when I saw them, enjoyed the most perfect health. But the good doctor, as he wrote I think in his last letter to say, having set his earthly house in order, has since betaken himself to a house without hands.

The households of the people need amendment, a more exquisite cleanliness ought to subsist. An atmosphere in all its divine purity ought to be breathed in doors and out of doors, by night and by day. How can a poor man, observes Mr. Helps in a letter to me, whose habits produce a nidus of disease, add to the great sum of human happiness, we are far more closely related to each other than we suspect. It is difficult, in truth, in narrow sleeping places with exigent night coverings, to effect the needful interchange of the inner with the outer atmosphere. Where cubic space and ventilation are alike deficient, the contained air must needs be bad.* For how is air to permeate slate or brick or glass or stone. It is perfect madness to trust to casual chinks and crannies for a supply so vital and indispensable. It must be alike subversive of health and purity to pass eight hours out of twentyfour, in some low ceiled room, a room charged with various foulness, and respiring air more or less tainted by many lungs. For, as Pettenkofer† remarks, the atmosphere becomes oppressive and disgusting, the nerves and head suffer, and faintishness is induced, even before the air is saturated with watery excretions, surcharged with organic matters, is robbed of its oxygen or laden with more than one per cent of carbonic acid gas. I have felt ere I have sat long in some close theatre or stuffy lecture room, as if a ligature bound my temples, and a sense of oppression has ensued that was not perhaps dissipated for hours. But the night is not the only time spent within doors. Indolence, coupled with the preposterous dread of the open air, hurts multitudes. For, as I must incessantly iterate, it is the indoor, not the outdoor exposure which we are to dread. Wind, wet, rain, cold, coupled with wholesome vigorous effort, are natures sharp restoratives, maintain health cheerfulness and vigour, blessings on no other terms to be enjoyed.

It was but a summer or two ago since I had occasion, while waiting for a conveyance, to spend an hour or two in a pretty country town in the southwest of Scotland. A row of

* Florence Nightingale, *Sanitary Condition of Hospitals*, p. 9.

† Ueber die Respiration. *Annalen der Chemie*, 1862.

dwellings, forming one side of the street, stood on a noble salmon stream. I sauntered into a shop to put some question about the fish, when a pale etiolated person, with sunken cheeks and a hacking cough, stood up behind the counter. I placed a fragment of the opium which I carry habitually since cholera times, in his mouth. You have had that cough some time, I dare say. Yes. And you spit up blood and matter, too, I fear. Oh, ay. His little bedroom was just beyond the shop, and through the casement, for the chamber door was ajar, I could just discern masses of waving greenery and the sheen of the ever rushing stream. You never sleep with that window open, most likely, do you. Na, he kenned better than that. Wad I hae him, he said, to breathe the cauld nicht air. I prescribed a little steel for the poor fellow, for he was very weak and bloodless, and strove to make him see that the open unprebreathed atmosphere, by night as well as by day, was his best friend, that it alone could cleanse his blood and free it from the else accumulating sordes, and that instead of dreading the air from the beautiful river, it was exactly that which, peradventure, was to waft him life and health and weal. The salt sea brine was not more surely destructive when it welled over the lips of the martyred maidens whose monument I beheld that day, than is the baneful stuffy atmosphere which is breathed, nightly and daily, by perishing thousands of the countrymen and countrywomen of that sick and suffering Scotsman.

Ah, how greatly to be compassionated is the victim to *phthisis laryngea* or tubercle of the larynx. He does not know what ails him. He thinks it is some obstinate cold that he has taken, hopes to soon get well. But it is no cold. He is in the grasp of a monster more deadly far than any python, any serpent. The serpent he might slay, but how is he to slay tubercle in the larynx and trachea. No, it too surely slays him. Tubercle of the larynx and treachea is commonly, nay universally associated with, and masks, lung tubercle. The voice turns harsh and husky, the respiration labours, and the utterance becomes no better than a whisper at last. What a succession of victims, as thus, have I seen during the years

that are past, all treading, silently, surely, the path whence none returns.* How many have I known subjected to torturing remedies, alas, have I myself tortured. And, yet, the remedy which could alone relieve or avert such a malady, was the one that was inexorably denied.

Professor Cohn of Breslau, author of the crowned work *On Emboli*,† went both to Paris and Berlin. But neither he himself nor those whom he consulted, in the first instance at any rate, detected the real character of his malady. It was *phthisis laryngea*, and no other. I saw him some two years or so before his decease, and conversed at length with him in such German as I could command, for although he read he did not speak English, on the nature of tubercle and my elucidation of its genesis. Already, as I have since thought, the seriousness of death overmantled his most sweet and noble features. Five thousand persons of those who had known and loved him, followed in last procession‡ the good physician to the tomb.

Although, in perhaps the immense majority of instances, the presence of the foreign body, termed tubercle, produce those symptoms and lead to those sequences which people agree to designate by the terms consumption, phthisis, decline, there are cases wherein, owing to some as yet inscrutable peculiarity of constitution, few or none of the ordinary symptoms, whether galloping acute or chronic, death at last excepted are present, and where unless on some ground or other there happen to be an examination, the very existence of tubercle may remain unsuspected and unknown. But there have been also cases in which manual skill proves fruitless, and the ablest stethoscopists, even, are at fault. Thus, instances are recorded§ wherein there was complete absence of hectic, sweating, colliquative diarrhoea, cough, expectoration, or even emaciation, and yet after death an amount of pulmonary tubercular destruction has been discovered that must be witnessed to be believed. The

* Vestigia nulla retrorsum. Horace.

† *Klinik der embolischen Gefässkrankeiten, mit besonderer Rücksicht auf die ärtzliche Praxis*, Berlin 1860.

‡ Leichenzug.

§ Workman, *American Journal of Insanity. Report of the Toronto Asylum*, 1863.

practical inference from all this is that we are not only to arrest tubercle where we can, but also to avert it altogether.

How numerous are the amenities of many English, Irish, and Scottish homesteads, nestling amid the green leaves, while living leaping waters and perfumed winds conspire to render them wholesome as agreeable. And, yet, enter some rural dwelling and ask the wasted workworn parents how they fare. What, but this poor chamber for so many. No more. Here, father, mother, growing children, young men and women, and, in the event of death, the unburied corpse,* occupy this restricted space as best they may together. Do you open the window by night. Lord love you, no, we should get our deaths. But you die as it is before your time. That fine young woman who sits and sews there, spits blood, you tell me. Your little Betsy has white swelling. That tall boy coughs suspiciously. Mary Anne, I fear, has Potts caries of the spine, and all this from breathing prebreathed air. Did the doctor never tell you to open your windows. No, sir, he told us nothink, besides we never asked him. What can poor folks do, we must labour hard and cannot afford these fine doings. But, my dear good woman, fresh air is not costly. God gives it to you for nothing. Cleanliness is not expensive, and health is cheaper than disease. Besides, you are quite mistaken as to the nature of your childrens maladies. The coughing and the spitting which some of them ail, did not accrue from catching cold. The swelling in Betsys knee was not occasioned by a blow, or poor Mary Annes malady by a fall. These complaints, however much they seem to differ, are all owing to tubercle, and tubercle is owing, and only owing, to rebreathed air. Yes, in truth.

Sanitary and other reports furnish unlimited illustration, were I to cite them, of the foregoing. The difficulty is to know where to pause. At the Norwich Guildhall the inspector detailed two shocking instances,† one of a family of four adults and five children sleeping in a low up stairs chamber, fourteeen feet by eleven, another where father mother and

* Pycroft, *Twenty Years in the Church*, 4th Ed., p. 27.
† *Manchester Guardian*, 11 October, 1861.

seven grown up sons and daughters all occupied a cottage room some eighteen feet by ten. The window was but two feet by one foot three inches. On going up stairs in the morning, said the inspector, the air was sickening. What must it have been during the night. Such, then, were the cottages in Eaton. Mr. Calthrop of Spalding, in a circular, dated March 1856, describes a very bad state of things. In May, 1862, a deputation waited on Lord Palmerston to represent the present condition of English schools as injurious to bodily development and violating all the laws of physiology. It was shown that owing to sanitary neglect the mortality in the metropolitan school districts was seven thousand annually, whereas by improved sanitary treatment the death rate in other schools had been reduced one half. Indoor life, it is, coupled with cramped postures in an unchanged stagnant atmosphere, that proves so hurtful to man.* Persons engaged in occupations which require the hands alone to move while the lower limbs remain motionless, should recollect that without occasional effort and change of posture their health must be destroyed. They should sit erect as possible. With seamstresses clerks and penmen, generally, there is always more or less stooping, tending to embarrass and retard circulation and respiration. The occasional sighs and long drawn breaths evince the crimping and confinement of the lungs. Health there cannot be without free respiration. The life giving element is in the air, and if the same air be rebreathed disease must intervene. Strength and robustness come from exercise. Confined attitudes violate physical development and natural instincts. Ventilation ought to be constant not intermitting, and yet there is often no ventilation, and no bodily action, so to speak, at all. In fact, the atmospheric movement of unprebreathed air in our chambers should be ceaseless as in the lungs themselves.

Throughout Great Britain and the world the homes of human beings, the workshops and factories wherein they toil, are too often constructed in flagrant violation of every physiological law. In numbers of printing offices compositors often

* Elliott, *On Domestic and Hospital Ventilation.*

work long hours at case in low ceilinged chambers, three and four stories from the ground, so arranged that in addition to the evil products of respiration generated on the spot, they are condemned to respire, more or less, the impurities coming from below. This ought not to be. No workshop should be the common receptacle of respiratory impurities from another workshop. No workshop should be without its effective Watson or MacKinnels ventilator, getting rid of rebreathed air, and replacing it by air unbreathed and new. In Dorset, Northumberland, Westmoreland, the state of things is especially defective. On the banks of a lovely tarn in the last named county, amid such air, such scenery, withal, I saw six children, as they issued from an adjoining house, sallow unhealthy pale. In the name of God, I said to the people, do you never open a window. No, never, was the reply. During my brief stay I went into many of these dwellings, and among the rest one close by Skelwith Force.* A single pane turning on a swivel, for day use only, was visible in the second story. In this house there lay on a sort of settle, a little girl with scrofula of the hip, wretchedly pallid and ill. Seeing that the weather is now so fine and summery, I said to the childs mother, suppose you were to take her a little out of doors by day, and at night to open the chamber window where the poor thing sleeps. See how pale and ill she looks. The doctor has not so much of a colour, hisself, said the foolish uncompliant mother, afterwards, to the lady who had brought me in. And, now, doubtless the child lies in her green grave winnowed by those breezes which, had she only been permitted to inhale them, would have kept her living and well for many a year.

Dirt and disorder are wholly at variance with the divine prescription. The God of goodness is also a God of purity and order, and we must be pure and orderly if we would resemble him. Were the Englishman but to add to his love of cleanliness the love of fresh untainted air, how vastly would it benefit him. He builds himself a mansion of brick and stone. The stagnant prebreathed inside air he retains carefully, the moving rushing balsamic unbreathed ether, outside, he rejects

* *Foss*, Danish.

utterly. I recollect early in life when travelling with my good brother, it was during the old coaching times, there entered the vehicle about nightfall, a gentleman of some thirty years of age. His raven locks were damp and matted, his face was oh so thin and pallid. And I can yet recall, for the impression was ineffaceable, those wistful hollow melancholy eyes that once confronted mine for hours. His hands when he ungloved them, were long and cold and thin. His voice was cavernous, and such a cough. One might have said that he had sat to the Father of Medicine for his portrait.* Every now and then matter welled up from his poor lungs, while a woman who sat beside, and who had entered the carriage along with him, tended him with such solicitous unswerving care. He was but one of the vast consumptive army of the period, just such a victim to tubercle as subsists about us now, and shall continue to subsist, until people everywhere learn to obey that law which prescribes the respiration only once of the same air.

In the narrow precincts of ill ventilated bed and living rooms, bereft of pure oxygen supplies, poisoned besides with effete watery and gaseous excretions, and foul animal effluvia, tubercle is precipitated from the blood with fatal certainty and celerity. Two per cent of carbonic acid gas as derived from respiration, will kill a singing bird, four per cent will destroy a man and extinguish a burning taper. What then must it prove, when in addition to this dread environment, infants are covered up in cradles, and bound so tightly† that they can hardly breathe, and when young people, any of them, are suffered to sleep with their faces downward or buried in the clothes, or beside the aged the sickly the intoxicated and the unclean. Well do I know, says Pettenkofer,‡ that to insure our normal wellbeing, we ever need an atmosphere containing

* Καί τους μεν ὀφθαλμοὺς κοιλαίνονται. κ.τ.λ. ΙΠΠΟΚΡΑΤΟΥΣ ΠΡΟΓΝΩΣΕΙΣ.

† Il faut avant tout éviter d' emmaillotèr les enfans qui sont affectés de congestions pulmonaires. *Maladies des Enfans*, 2 ième Ed., p. 545.

‡ Wir wissen nur, dass wir zu unserm normalen Befinden stets einer Atmosphäre bedürfen, welche viel mehr Sauerstoff und viel weniger Kohlensaüre und Wasser enthält, als für den Fortgang der Respiration und Perspiration gerade nothwendig erscheint. Pettenkofer, Ueber die Respiration, *Annalen der Chemie* 1862.

far more oxygen, and far less carbonic acid and water, than what is barely needful for the exact discharge of the respiratory and perspiratory functions. Now, these are truths that should be instilled into all before habit dulls the physical and moral sensibilities, and leaves men ignorant of or indifferent to matters of such vital moment to us all.

How many promising young men have I known whose career was arrested by the invasion of tubercle. They had studied everything, knew how to guard against everything but that. The prevalent dread mortality from tubercle, as I lay claim to have shown, is coextensive with an equivalent infraction of vital law.* We exclude air, I mean unprebreathed air, and we interfere with or supersede natures spontaneous ventilation, which, if only let alone, would be governed by the same laws as govern the winds of heaven themselves.† The mortality from phthisis in conventual and monastic establishments is very great. Laennec mentions a convent in Paris whose young inmates died of phthisis with frightful rapidity. The ill aired dormitories of the Trappists, even now, are said to be intolerable.‡

Once it was thought, most futile imagining, that the breath of brutes might arrest decline, and persons of condition wooed hygeia in the cowhouse. Sheep, even, were introduced into sleeping apartments.§ But the brutes when forced upon prerespired air, are no more exempt from tubercle than we are ourselves. For air prebreathed, causes tubercle in them as fatally and as certainly as it does in us.

Free as air, indeed. But air within doors, at least as people commonly live and breathe, is not free at all unless when loaded and polluted it is left free to poison them. It is free to do that, and yet it is not free, pure and unpolluted, free as light itself, to enter our dwellings, there to refresh the life and renew the blood of man. The superstition of our ancestors, in respect of the kings touch, some saints gift to the French and English kings, seems now to be transferred to oil pressed

* Mac Cormac, *Methodus Medendi*, Lond. 1842, p. 158.
† Mac Cormac, *Sanitary Economy*, Lond. 1853, p. 84.
‡ Musgrave, *Ten Days in a French Parsonage*, p. 84.
§ Beddoes, *On Consumption*, p. 84.

from the livers of fish. But as the one childish and irrational credence, thanks to William III.,* has vanished in England, so in its turn will the other. No more French kings shall set forth in procession to cure people of the *ecrouelles*, the cruels in the English vernacular. And English physicians, too, shall cease to prescribe a remedy which has not even the golden recommendation which attended the royal touch. We have arrived, says Phillips in his treatise on scrofula, in the middle of the nineteenth century, without the discovery of a single remedy for the cure of the disease. And, yet, it is simply impossible, were it by means of all the arcana of the healing art, to effect the faintest advance in the treatment or prevention of tubercular disease, unless we admit, as Phillips himself in fact did not do, the perfect identity as regards their origin and nature of phthisis and scrofula,† and, likewise, as I must ever insist, their invariable sequence on rebreathed air.

When the late Professor Davidge, of the University of Maryland, published his Latin Nosology some forty years ago, and gave his definition of consumption, *scrofula pulmonum*, he was assailed abroad as well as at home, with a torrent of adverse criticism, and denounced as though guilty of medical heresy. In his physical sketches, however, Davidge vindicated his doctrine, that the vitiated condition of the blood, which characterizes scrofula, is equally present in tubercular phthisis.‡ Scrofula and consumption, both one and the other, may be prevented by the respiration of air not prerespired, air not breathed before. By the same all potent agent they may be alike arrested and, perchance, often cured. But when the lungs become disorganised, utterly, and when the admirable economy of the living frame falls into ruin and decay, how is recovery possible. No, death under such circumstances becomes the inevitable, and in truth the only desirable issue.

Until the entire community, medical and otherwise, shall become persuaded that the respiration of air not prebreathed averts, and alone averts, consumption and scrofula, absolutely,

* Macauley, *History of England.*

† La diathèse tuberculeuse et la scrofule sont une seule et même diathèse Bouchut, *Maladies des Nouveau Nés.* p. 986.

‡ Reese, *American Medical Gazette.*

they will not be at pains to secure it adequately. The great present dread, indeed, of patients and medical practitioners, alike, is contact, immediate contact, with the fresh, free open atmosphere. In the abstract, they all admit, nay, boast, of the blessings of untainted air, air untainted by the breath of man and brute, but, in the concrete, they will have none of it. Yes, there are those who would not pull down a window, by night, no, not if it were to save them from dying. Neither will they go out of doors, by day, so as to secure the sufficient amount of healthy organic life and action. During our day life, indeed, we must beware of draughts, but by night abundant coverings render them not only safe but pleasurable as they are desirable. If incessantly renewed air prove requisite in health, what must it be in disease. And, yet, the poor consumptive sufferer is guarded against every waft. Nay, it has even been proposed to shut him up in some confined, stoveheated precincts, to realise, as it were, in his behalf a sort of artificial Madeira. But artifice will never do. It is nature, not artifice, that we stand in need of, not artificial Madeiras, but the free, untrammeled atmosphere of heaven itself. Therefore it is that a recent announcement, supported as it is by the names of seven and fifty eminent London physicians and surgeons, of a design to cover in a large space of ground with glass, a crystal sanatorium, in fine, where the consumptive may enjoy an equable temperature along with the fruits and foliage of a more southern clime, is, at least in this case, mere φλυαρία, opposed to sound theory and reasoned observation, alike. It is not, contrary to popular and even medical prepossession, the absence of humidity or cold or moisture, but, on the contrary, exposure to all the three that is needed. For these, rightly dealt with, are mans best friends, purify the red blood, induce the ruddy cheek and lip, and sparkling eye. A glass house, big or little, viewed as a residence, would be but a glass full, more or less, impossible to ventilate, of foul air. The gentlemen who attested by their names the desirability of such an erection, and who 'would recommend many of their patients to be domiciled under its roof,' are actuated by the best and kindest intentions, but, as

respects the treatment of consumption, labour under a most serious misconception. If, day and night and always, there be one thing, in respect of this matter of consumption, more desirable to insist upon than another, it is the ceaseless and uninterrupted admission of air not prebreathed at all, air not stagnant, not stationary, so as to get rid, both in the blood and the medium in which we live and breathe and have our being, of disintegrated tissue, its educts and products, altogether. For, do you not perceive, oh reasoner, that the conditions of healthy life, indeed of all life, are incompatible, utterly, with the indefinite retention of the unburnt metamorphic waste, or any portion thereof, within the living organism. A higher level as regards health and stamina than anything which we have yet been able to realise is, I am satisfied, mans intended portion, satisfied that it is indispensable to that better, nobler state, both in respect of the body and the soul, which God and nature, his divine handiwork, most surely and clearly intend and design for all of us.*

There is to me something more touching than I can find language to describe, in regard of the too frequent cases of medical men, many of whom sick, dying, and finally perishing of tubercle, have, in the long course of my experience come before me. They have always combated, and often triumphed over disease and death in others, and now, to their dismay, are called upon to do battle with both in themselves. They have borne the cross, incurred the pain and care, but, as regards this life at any rate, they have not won the crown. Most of them have wife and child, indeed every belonging except health and wealth. They are too well aware of the symptoms and nature of disease, poor sufferers, for any gloss of kindness or friendship to deceive them much as to the issue of their malady. Doctor, one after another, have they said to me, my breathing is worse than indifferent. I can hardly walk, you see, up stairs, much more breast a hill. I expectorate matter, too, and the matter is tinged with blood. I fear, and then they look at one so wistfully, I fear my lungs are gone.

* La grandeur des desseins de Dieu dans la creation de l'homme. Simon, *Religion Naturelle*, Paris 1856, p. 177.

I was just consulted by one who had passed long years abroad, and who like many others returned to his native air hoping to live not die. I know one now cut short in his career of usefulness, well aware indeed of his position, and putting in his little remaining time as best he may. Years ago one of these poor sufferers came to place himself under my care, and after a time he died, even as I sat beside him, gazing at me with glazy eyes, from a sudden insultus of *angina pectoris*, but one alas of his life consuming maladies.

Another, whom I was attending, sent for me one day, hurriedly. Tell him, he said, tell the doctor, that I have a question of moment to put to him, and that I fain would have it answered ere I die. I came with speed, but already my young friend was dead. His face, even in death, was lighted up with a smile, a smile full of all sweetness and intelligence, a smile untinged with a dread or a fear. I have often since pondered on the unanswered question and wished so I had been in time. Somehow, doctors seldom do recover from phthisis. Perhaps it is that witnessing the incessant spectacle of destruction, they are too apt to give up. Besides, they too rarely enjoy the means and appliances which they are wont to prescribe for others. Their income ceases when they cease to work, and so they are unable to lie up long. Perhaps enough consideration is not awarded medical men. Vulgar minds do not sufficiently appreciate intellectual products and intellectual labour, or enough reflect, when they call upon a medical man, that they are about to reap not only the fruitage of the moment, but of all his past life and labours. Nevertheless, I once witnessed, alas, it was but once, a magnificent recovery in a young physician. He had had every feature of the malady, the consuming hectic and profuse expectoration. His hair fell out, the emaciation was extreme. And, yet, he rallied from it all, to perish four years afterwards of another malady in a distant land. Among those I tended there was yet another, such a one as the world does not often see. Far advanced in the malady, of which to my deepest regret he and the young wife he so dearly loved alike perished, he came too late to know and to adopt all my views as to the nature and origin of

tubercle. Ah, said he, speaking one day of himself, my wishes and aspirings ebb and flow, exult and decline, like the sea. They were about the last words of a good man and a true, the words of one whose life had passed like a streak of light upon the waters or sunshine on the wall, the words of one who is no more.

'In matters of physical demonstration,' he once wrote to me, 'it is quite ordinary and possible to pass half a life in following up a train of thought and observation, and having after infinite research arrived at or near a conclusion, to put the whole matter within five minutes comprehension of another intelligence. The one has had to scent, to follow, and to find, but having found, it is easy to show how. Euclids first proposition cost him perhaps years, yet any one is forced to submit in a few seconds. There is nothing so recondite in this carbonaceous business that any well informed person may not at once understand. There is tubercle, half carbon. There are lungs whose office it is to oust carbon. There is air fouled with carbon, and *ergo* blood the same. This foulness the blood, the systems pabulum, cannot get rid of, and so it poisons that system, lungs first and liver, mesenteric, and then other glands and tissues. It is an almost solemn consideration that these organs act for life and death, unconsciously. It is as if nature said, there is a true life of mine, and you must learn it and live it or suffer in body sense and soul. You shall suffer through all generations till you obey me. Therefore, obey me though you rebel against all authority and power. *Nemo me impune lacessit,* as the conceited Scotch have it. Nature, therefore, is a Scotch thistle. What is it that has made man so foolish beyond every other beast. The tree of knowledge is, after all, a sign of the curious knowledge of old. The brutes do not know. Deadly disease and the causes of disease, act on the unconscious organs. If I be normal, I know feel distinguish nothing of the action and existence of these organs. Nay, the very fact of not knowing or feeling is a sure test of health. My God, that I and every fly should carry about with us, a part of us, a system as grand and glorious as that of the related universe, and neither know nor feel, and

happier not to know or feel. This sustains us. The organs by which we feel know and enjoy or suffer life, those of whose action we are not only intellectually to a vast degree ignorant but even unconscious, do not suffer or menace us with death. Physiology disunited from psychology is deprived of its senses. Pathology studied only on the *cadaver* is baulked, for life is not death. Nevertheless, one thing is true, that air is necessary, and, *ergo*, pure air. And for that reason, only, to have insisted and seen and told, I hold you to have done more than Harvey.

'I have been very ill, again the same enteric horror, commencing with intense symptoms of fever. I am sadly broken. I have a cough, too, and much expectoration in the morning, with an occasional rattling in the left side which I do not half like. The truth is I am intensely unhappy lonely miserable, and cannot find a source of interest in any one thing in the world, springless summerless undone. Everybody is dead and gone. I feel very lonely. The earth slips away beneath my feet. Soon very soon it shall be also with me, dust to dust. God bless you.'

The various local affections induced by the presence of tubercle, are a mean of the constitutional degeneration coupled with that of the parts implicated. The history of scrofula as thus, indeed, has never been written. Volumes would not exhaust the subject. All the joints become tubercle infested, the large joints and the small. Those joints and quasi joints, as the spine hip knee ankle heel foot, which are concerned in locomotion, entail when diseased greater distress, therefore, than does struma of the shoulder elbow wrist hand. When the cancelli of the bones are seized, it entails long and tedious suffering. But when the synovial membranes if not the cartilages are also the seats of tubercle, it induces a somewhat different and yet more serious order of symptoms. White swelling or tubercular synovitis of the knee, so far as my observation extends, is more common on the Continent, in France at least, than here. In this, as in enteric tubercle, the sufferers waste away till nothing, if life last so long, but skin and bone so to speak remain. I have had to deal with cases, such cases, of

tubercular devastation in the lungs joints mesentery, that, unless witnessed, it might seem impossible that the frame should sustain and live. Mrs. Morrison died of intercurrent pneumonic hepatisation from cold. Yet, lungs in such a state were perhaps never before seen. Tubercles and tubercular cavities there were in every stage and of every degree. Many were the size of walnuts, and one, not yet softened, had actually attained the dimensions of a small orange. The aggregate amount of tuberculous matter, in such cases, is very great, and alone is incompatible with lifes continuance.

Tubercle of the nervous centres, tubercular meningitis of the brain, and, less frequent, tubercular spinal meningitis, is also most serious and destructive. And, yet, I have witnessed recoveries, even after effusion into the ventricles, in three instances, in one of which coma had subsisted fourteen days, in another seven, and in a third three. In the last fatal case of cerebral arachnitis or meningitis which I had occasion to witness, the young patient, a beautiful and perfectly formed child, occupied a magnificent chamber, but its crib or cot was boxed round and, moreover, covered at the head, and further provided with a drapery or fringe that came down within a short distance of the childs face, so that it was impossible that it should fail to respire, more or less, and again and again, its own breath. I did not see it in consultation, until it had been many days ill. Nevertheless, up to the moment when I first saw it, this so frightful arrangement had continued to subsist.

Gölis, who has written a remarkable monograph on cerebral meningitis or, as he knew it, water on the brain, devotes a chapter* in his first volume to the consideration of the prophylaxis. And, yet, in the long list of antecedents, as he esteems them, he does not, for indeed he knew it not, once advert to the real and only source, to wit rebreathed air. The work is prefaced by a touching dedication to the memory of a sanitary inspector, whose name he says is uttered daily with prayers of thankfulness in thousands of the dwelling places of

* Vorbauungskur der hitzigen Gehirnhöhlenwassersucht. *Ueber die vorzüglicheren Krankheiten des kindlichen Alters.* Erster Band, S. 202.

imperial Vienna. And, yet, imagine sanitary inspection, however good in other respects, that paid no effective heed to renewed air.

Tubercle is met with in the form of grey, but vastly oftener yellow concretions of widely varying dimensions, commonly or at least often rounded or globular, owing to the contiguous pressure. Considered microscopically it displays disintegrated tissue, epithelial cells, irregular corpuscles, and fat globules, perhaps a little cholesterine and extractive. According to certain French estimates,* a hundred parts of solid tubercle will be found to contain of animal or carbonaceous matters ninetyeight parts, chloride of sodium and oxide of iron traces, while the carbonate and phosphate of lime furnish in about equal proportions the residue. In other respects, tubercle is without vascularity† or fibre‡ or structure§ or nerves. It is not a living morphological structure, but as Vogel calls it, an unorganized epigenesis. Virchow names it a pitiful degraded product. By others it has been termed a cacoplasty. The oil or fat globules, so often present, are mainly adventitious.‖ Otherwise, the histological and chemical elements, in man are always in essentials the same. Tubercle affects habitually the summit of one or both lungs, but very much oftener, preponderantly, one lung rather than both.¶ The impairment of function, and the so frequently great distress attendant on tubercle of the lungs and trachea, force it, when in this situation, on the attention of the sufferer. Often destroying, many times it thrusts aside, the living tissue, otherwise distressed by the weight and pressure of so much dead adventitious matter,(1) amounting perhaps to a third of the entire weight(2) of the

* Louis. Art. Phthisie, *Dictionnaire de Médecine*, 2 ième Ed., Tome xiii., p. 316.

† Der Tuberkel besitzt keine ihm eigenthümliche Gefässe. Rokitansky, *Lehrbuch*, B. i. Section 300.

‡ Virchow, *Cellular Pathology*, Chances tr., p. 475.

§ Lebert, *Anatomie Pathologique*, Tome ii., p. 332.

‖ Vogel, *Pathological Anatomy*, tr. p. 276.

¶ Le siége de prédilection de l' incubation tuberculeuse est, on le sait, le sommet de l' un des poumons, et il est rare qu' avec de l' attention, on ne puisse constater quelque chose du coté opposé. Trousseau, *Clinique Médicale*, Tuberculisation Pulmonaire.

(1) Der Tuberkel verdrangt bei seinem Wachsthume die Elemente des erkrankten Gewebes. Rokitansky, *Lehrbuch der Pathologischen Anatomie*. I. S. 292.

(2) Roche. *Dict. de Méd. et de Chir. Prat.* Art. Phthisie.

parts implicated. Occasionally, a fragment of lung or a portion of artery is included, or the artery itself becomes tuberculous and, yielding to the pressure, entails at one time slight, at others frightful and fatal hemorrhage. Hemoptysis, if not invariably so, is the too common index and attendant of tuberculised lungs. Like other dead and effete matter, tubercle takes all its increment all its growth from without. But when it softens, it is commonly from the centre to the circumference. At a certain stage it resembles nothing so much as softened cerebral matter or decayed cheese, distributed throughout the affected tissues in masses not very unlike the suet in the cold pudding as seen in cooks shop windows.

Nature strives continually to promote the elimination of tubercle. Tubercle may be absorbed into the current of the circulation, or, if in the lungs, it may be simply evacuated through some adjacent bronchial tube. If, however, tubercle adjoin the ventricles, joints, pleural or peritoneal cavities, inflammation, perhaps, is set up, and its products, coupled with the matter of tubercle, itself, are poured into the cavity contiguous. Often, tubercle seems to macerate, as it were, in the pus which the irritation of its presence has engendered. The fatty infiltration of tubercle, Walsh and Virchow both look upon as favourable to its softening and final absorption. But tubercles may otherwise dry up, wither, and become as it is termed obsolete. Here, also, natures beneficent agency is at work. Happily, direct evidence of the absorption of tubercle is furnished under our very eyes, in the disappearance of tubercular infiltration from the exterior lymphatic glands, an occurrence which I have often witnessed, and many times have been able to promote.* The records of pathology are full of instances of the calcareous or cretaceous obsolescence of tubercle.† This calcification Broussais,‡ and I think very justly, ascribes to

*Die Aufsaugung der ganzen Tuberkeln wird haüfig beobachtet aus den Lymphdrüsen des Hautzellgewebes. Gluge, *Atlas*. Section, Die Scrophulose und die Tuberkulose.

† Verkreidet die erweichte Tuberkel nicht selten. Rokitansky, *Pathol.* B. i.

‡ Les dégénérescences calcaires pierreuses, ne sauraient être considérées autrement que comme des effets du jeu des affinités chimiques devenues libres jusqu' à un certain point. *Histoire des Phlegmasies Chroniques*, 4 ième Ed. Tome ii., p. 239.

the play of chemical affinities let loose. As it is in the centre of the naissant tubercle that the first yellow point appears, it is in the centre likewise, as stated by Valleix,* that the first cretaceous deposits ensue. Occasionally, the cretaceous matter is expectorated during life, but much oftener it is only discovered after death.† Formed through the elective affinities principally of the carbonates and phosphates of magnesia and lime, it constitutes in fact the calcareous phthisis of Bayle.‡ This disposal of the precipitated or deposited carbonaceous waste is a farther effort on the part of nature to render tubercle harmless. Instances of the cretaceous conversion of tubercle, as occurring say in the lung apices, mesenteric and bronchial glands, are described by all pathologists and among others by Gluge in his great work. Carsewell Reynaud Andral and many besides, farther relate cases of persons dying of various maladies in whom calcined tubercle, the result of long anterior phthisis, was discoverable. In an asylum for aged persons, Rogée§ actually determined in not less than fifty per cent of the remains of the dead, these stony or mortar like concretions in dimensions ranging from the size of a pea to that of a filbert. When the tubercle masses and the accruing vomicae, however, are very large and numerous, when pent up they rot as it were in the midst of the organism, when they implicate many organs, important vital structures, and when as too often happens they induce excessive local irritation and constitutional exhaustion, coupled perhaps with colliquative diarrhoea and more or less serious advanced hemoptysis, it will be obvious how tedious must their elimination prove, and even when eliminated, how difficult for the cavities, often rough multiform and anfractuous, which they leave behind, to heal.

* C'est dans le centre de la granulation grise ou du tubercule naissant que parâit le premier point jaune, c'est encore au centre qu' on observe la matière cretacée ou calcaire, formée principalement de phosphate uni au carbonate de chaux, chlorure de sodium, d' oxide de fer et de matière animale. *Archives Générales de Médecine.*

† In verkalkten Tuberkeln phosphor und kohlensäure Kalkerde je mehr die Tuberkeln verhartet sind. Gluge, *Atlas.*

‡ Mémoire sur la phthisie pulmonaire. *Bibliothèque Médicale.* Tome xxxvii.

§ Essai sur la curabilité de la phthisie pulmonaire, la transformation des tubercules, et la cicatrisation des excavations des poumons. *Archives Générales de Médecine,* Tome v.

Oh, if only once the great leading therapeutic idea could get possession of the public mind, that in respect of tubercle, its prevention and arrest, nothing is done unless we cease utterly to respire air that is prebreathed. The labours of the Danaidae or of Sisyphus, himself, were futile indeed as compared with the task which awaits the practitioner who would treat phthisis without the arrest of further interstitial tubercular deposits. For this is the one the inevitable antecedent of the rational treatment of tubercle and of every possible cure. Fortunately, the arrest of tubercle is easy as the cure itself is difficult. In order to arrest tubercle, its further growth and deposit, it is simply requisite to breathe unprerespired air. But to render harmless tubercle already deposited, though a feat which nature often achieves by way of calcification and otherwise, is anything but certain at the hands of art. Early deposits we may indeed remove, but it is precisely in regard of these that medical interference is least frequently sought for. Too often everything is attempted except that without which all treatment is in vain. Remedies impotent as ridiculous have been tried, nay still are tried by the score. Thus, Cabanis* a man of undoubted ability, and in his day professor at the Paris Faculty of Medicine, actually commends the efficacy of carbonic acid gas in certain cases of consumption. Young, himself,† perishing of the malady on which he had enlarged with so much learning and ability, commends venesection, as Boerhaave‡ and Sydenham§ had done before him, and practised it too, poor soul, in his own case. It is with a sense of humiliation that I recal to mind having myself had recourse to bloodletting in hemoptysis. But I had time, so to speak, to condone my error. The subject of my treatment not only regained her health but became the happy parent of a somewhat numerous, and, it will be nuts to the hereditary transmission men to know, perfectly

* C'est par cette propriété qu' il paraît avoir produit d' heureux effets dans certaines consomptions pulmonaires. *Rapports du Physique et du moral de l' Homme.* Paris 1824. Tome ii., p. 248.

† *Practical and Historical Treatise on Consumption.* London 1816.

‡ Curatur venaesectione larga, tertio quoque die, ad quartam usque vicem, repetita. *Aphorismi*, Section 1200.

§ Sydenham, *Swans*, tr. Lond. 1763.

vigorous and healthy family. Belief in such transmission is quite incompatible with any rational course of treatment. The shark the ling and the coalfish oil with which the poor consumptive in recent years, have been, nay at this very instant, are, so plenteously drenched, in what respect is it preferable to certain animal products for whose virtues Fernelius* and others of our credulous ancestors so liberally vouched. What does the able and judicious Lehmann† say or rather what did he say respecting it, for alas, his wise utterances are for ever stilled. The idea, says Lehmann, that cod liver oil as a mere material of combustion should prove of benefit in a disease where the lungs are so entirely clogged and degenerate, could only be entertained by persons wholly ignorant of tuberculosis or pulmonary consumption. Nature, indeed, continually essays to get rid of tubercle, but through our baleful habit of respiring prebreathed air, we add tubercle to tubercle and so defeat her efforts, until life give way in the struggle at last. How is it possible, observes Baudelocque,‡ that children who rarely spend so much as four hours daily in the open air, or even go out at all, should escape the evil influences of the remaining twenty. The beneficial efficacy of an unpolluted atmosphere, of which the prodigious and unsullied supply marks the measureless importance, in respect of the purification and integration of the blood, intermits not were it for a moment.

Quietude and rest, with close airless chambers may be all very well for the aged and decrepit, those just stepping into their graves, but are simply death and destruction for the young. To secure health and wellbeing, with immunity from tubercle, there must subsist incessant resort to the open air,§ *sub divo*, as the wise ancients termed it. They, indeed, thought it better

* Mumia humanis est cadaveris liquamen—calida sicca ordine tertiis—sanguinem undecunque prorumpentum sistit. Fernelius, *Universa Medicina*, Lugduni Batavorum 1645, p. 258.

† Lehmann, *Physiological Chemistry*, tr. Vol. i., p. 268.

‡ Il se passent beaucoup de jours durant lesquels ils ne sortent point. Il leur arrive rarement de rester dehors plus que quatre heurs. Ils sont donc renfermés au moins vingt heurs sur vingtquatre. *Etudes sur les Maladies Scrophuleuse.* Paris 1834, p. 128.

§ Pour préserver l' homme et les animaux des affections tuberculeuses, il faut les soumettre habituellement, dans l'état de liberté aux influences de l' atmosphere. Fourcault, *Causes Générales des Maladies Chroniques* p. 21.

to get out into the open* than remain under cover. In doors, even with directest communication with the outside air, it needs a current,† or if I be permitted the expression a draught, in order to secure the needful interchange. Warm coverings by night make currents, in other words a moving atmosphere, harmless. Lifes exigencies render them desirable. People talk about draughts, but how is air to be renewed without motion. Of all the organs, observes Carswell,‡ the lungs in respect of the extent and frequency of the tubercular deposit, hold the highest rank. Why is this so, why but because the lungs have to sustain the first assaults of prerespired air. And, further, why should the lung apex prove the starting point and especial habitat of tubercular effusion. Rokitansky§ says we do not know. On the contrary, I conceive that we do know. It arises, undoubtedly, as Jones and Sieveking‖ have pointed out, from the lesser expansibility of the apex, especially in the indolent and sluggish, and, as Silvester¶ after them has said, the imperfect aeration of the upper and back portions of the lung apex itself. There are individuals in whom the respiration, feeble at all times, seems absolutely never to quicken or to assume the vigorous action which nature designs. How are such persons to escape tubercle. In fact, they do not escape. Living habitually within doors, making no effort, and breathing prebreathed air, continually, they become tubercle stricken as a matter of course.

If any argument or circumstance, could bring conviction as to the imperative necessity of having incessant recourse to an adequately renewed atmosphere, it would be the fact that tubercle deposits ensue so readily in early life. In early, the metamorphosis of tissue is nearly twice as varied as it is in advanced, life.(1) I really can find no language adequate to

* Melior est ambulatio sub divo, quàm in porticu.' Celsus, *De Medicina*.

† Le renouvellement de l' air n' a pas lieu aussi facilement qu' on pourrait le croire. Il faut qu' un ou plusieurs courans viennent multiplier ce contact en faisant traverser par de l' air pur celui qui est vicié. Baudelocque, *Etudes*, p. 160.

‡ *Cyclopedia of Practical Medicine*. Art. Tubercle.

§ *Pathological Anatomy*, Days tr. Vol. iv, p. 105.

‖ *Pathological Anatomy*, p. 445.

¶ *Physiological Method of Treating Consumption*. Lond. 1862.

1 Rücksichtlich des Einflusses des Lebensalters auf die Respiration haben Versuche gelehrt dass die Menge der täglich excernirten Kohlensäure bis zum 40.

enforce obedience to this mighty hygienic call. If parents only knew, if medical men were but persuaded, that air unrenewed, air loaded with effete carbonaceous and hydrogenous waste, air with less than twentyone or two per cent of oxygen, led of necessity to tubercle and death, how earnestly would they oppose its inhalation.

Pure respiration is the law of life, impure respiration is the law of death. One is immunity and health and strength, as *quo ad*, the other is defeat and destruction and doom. Even Lebert,* for all so unhopeful as he is, agrees with most pathologists that cretaceous transformation, coupled with the cicatrisation of tuberculous ulcers, is at any rate significant of a curative tendency. Tubercle, then, and tubercle engendered maladies are preventible. The means, means secure and certain, subsist at every door. The origin and perpetuation of consumption and scrofula are not natures work. They spring from mans neglect, his ignorance, his disregard of natures requirements and the great Creators law.† The Almighty has left within our reach the remedy close at hand with the disease in every clime and by every shore. Wherever the breathing supply contains less than twentyone or two per cent of undefiled oxygen, wherever air is fouled with respiratory excretions, there, the oxygen and ozone holder and carrier the blood will be defrauded, the unoxidised carbonaceous waste will not find issue by its natural and proper outlet, the lungs and skin, but in the form of tubercle will be arrested in the organic tissues and bring life to an unnatural and untimely close. It is natures law, the *veritas ipsa*, in fine the saving truth which, being applied, is to rescue humanity from the dread infliction which everywhere so besets our kind. For where does not phthisis rage. That we could live conformably to divine law and still incur tubercle, were to suppose that unreason was reason, madness wisdom, and chaos cosmos again.

und 46. Lebensjahre, mit der Entwicklung des Muskelsystems zunimmt. Berechnet man aber bei Kindern oder jungen Thieren die excernirte Kohlensäure auf gleiches Körpergewicht so stellt sich, heraus, dass Kinder fast doppelt so viel Kohlensäure produciren als Erwachsene. Lehmann, *Handbuch der Physiologischen Chemie*, p. 287.

* *Traité d' Anatomie Pathologique*, Tome ii, p. 233-5.

† Ancell, *On Tuberculosis*, p. 759.

One third of the artisan class, says Hannover,* die phthisical in Copenhagen. Alas, in this respect, there are many Copenhagens. In his admirable pleading Fourcault dilates on the dread ravages of tubercle in France, and the urgent necessity that subsists of taking steps to abate its appalling frequency. We are now, I assert, in a position to take those steps, to offer to every one actually exempt from consumptive scrofulous disease, entirest immunity from all and every form of tubercular infliction, immunity from lung tubercle, from tubercle of the glands, from abdominal and spinal tubercle, from throat and brain tubercle, from tubercle of the hand and foot, the shoulder and elbow, the wrist the hip the knee, in short completest immunity from tubercular degeneration, whether interior or exterior, of every kind and degree. Such, at least, is the result I have arrived at from unwearied painstaking inquiry and the analysis of natures operations in regard of the infliction and prevention of disease.† For long years, indeed, it has been with me a ceaseless contention, not only with the inherent difficulties of the subject, but with almost every species of alternate opposition, misrepresentation, and neglect.

The momentous facts with regard to tissue change, the ceaseless mutations undergone by the material of which the living frame is made, the immeasurable importance of getting entirely rid of the metamorphic carbonaceous waste, ought to be brought home to, instilled in, every mind. Alas, they are not so brought home or thus instilled. And, hence, the prevalence of infinite wretchedness and physical decay. The plainest truths, plain at least when once they are made known and clearly developed, are contested, and he who has no thought except to benefit his species, is too often treated as if he were not the friend but the enemy of his kind. Dr. Sieveking had the kindness, in my unavoidable absence, to read before the few who then happened to represent the Medico Chirurgical Society of London, my essay, *On the True Nature and Absolute Preventibility of Tubercular Consumption.* The pe-

* *Monatsblatt für Medicinische Statistik u. Gesundheitspflege* 1861.

† Omnis philosophiae difficultas in eo versari videtur ut a phaenominis motuum investigemus vires naturae, deinde ab his viribus demonstremus phaenomena reliqua. Newton, *Principia*, Prefat. Ed. Prima.

rusal of this paper, although the objectors, strange to say, never once adverted to my actual doctrines or the momentous facts on which they were based and which they embodied, was then and there characterised as mere loss of time. My doctrines were five hundred years old, they said, and otherwise well known. These gentlemen certainly did not understand my views or if they did they misstated them. It was a blunder either way. The dilemma is not one of my framing but their own. Thanks to me, these views are now securely registered in the records of our race never to be escheated or lost again. My paper, it was affirmed, *merely* stated that close rooms foul air *and other injurious influences*, favoured the production of consumption. All knew this before, and it was waste of time to enlarge upon a truism.* This averment suggests a half truth, and at the same time suggests the opposite of what is true. The half truth is the statement that foul air, simply, induces consumption, the untruth is in representing this as my entire and sole conviction, which it is not. My statement is that not fouled air, merely, but air fouled in the sense of being *prebreathed*, air fouled in and by the act of respiration and breathed again, induces and *alone* induces tubercular disease. And, this infinitely momentous fact, namely that prerespired air alone engenders tubercle, so far from being known five hundred years ago, was not known at all until I first discovered and pointed it out. And it is the truth, the very truth, which being known and acted up to, shall one day free the world from tubercular disease of every species and degree. The distinction is of the very last importance and one of which none of those to whom I here advert took the slightest notice, nor was it once referred to in the otherwise able summary in the *Lancet*. It was an error of intellectual apprehension, a tissue of unsustained objections, otherwise urged in a fashion which, happily, one is not often asked to encounter in the deliberations of men of science and of gentlemen.†

* *Lancet*, May, 1862.

† Royal Medical and Chirurgical Society. Dr. Babington, President, in the chair, *On the True Nature and Absolute Preventibility of Tubercular Consumption*, by Henry Mac Cormac, M.D. 'This paper, which was of considerable length, set forth the foregoing thesis, and wound up with some comments on

The proposition that foul air, merely, induces consumption is an indefinite, or as Sir William Hamilton would say an indesignate one. Its quality is not expressed. When quantified, as logicians term it, it would be as thus. Some foul air induces consumption, namely, prerespired air. The proposition, foul air induces consumption, being indesignate, it will not do under cover of its ambiguity, to allow my illogical opponents to impute views which I do not entertain. They fall foul of the general proposition, true enough otherwise, that foul air induces tubercle. Whereas my statement is that a *particular* kind of foul air, to wit *prebreathed air, alone,* induces it. Theirs is the *ignoratio elenchi* of confutation. Foul air and prerespired air are not coextensive. The quantity of the former measures the quantity of the latter, and much more.

the ravages of consumption and scrofula, which, the author asserted, follow entirely from the respiration of a befouled and impure atmosphere. For this, he said, was the *causa sine qua non*, without which consumption or scrofula there could not be. An imperfect hæmatosis, deficient aëration of the blood, insufficient oxidation of the tissue waste, were the conditions short of which tubercle was simply impossible. Consumption and scrofula were as purely artificial and as entirely avoidable as was poisoning by arsenic or corrosive sublimate. There need not be either of them if men will. The air by day, if possible, and assuredly by night, should be as pure as that which traverses the hill top, or is washed by the sea wave. He would as soon send an infant to sleep in a cellar as in an airless nursery, and he considered that there could be no immunity from the twofold scourge of phthisis and scrofula until medical practice and popular conviction concurred alike as to the indispensableness of fresh, untainted air.'

Dr. CHAMBERS characterised the reading of the paper as a waste of time. It simply stated that closed rooms, foul air, and other injurious influences, favoured the production of consumption. All knew this before, and it was waste of time to enlarge upon a truism.

Dr. O'CONNOR inquired whether the paper had been referred to a committee previous to its being read to the society.

Dr. TANNER said that it would be desirable that the fellows should be made acquainted with the papers to be read on certain evenings. He had expected that a paper would have been read from the pen of Mr. Birkett, or he certainly should not have attended. Dr. Mac Cormacs views on the subject of phthisis were well known, and were more than five hundred years old. He had advanced no facts in support of his theory, and he contended that the society had wasted its time in listening to the statements which had been made. It was not to be wondered at that the societies meeting room was empty, if such papers were submitted to the consideration of the fellows.

Dr. LITTLE said he must press the question as to whether the paper had been referred to a committee. The society ought to be protected against the reading of such productions.

The PRESIDENT said it was not the custom of the society to refer papers previous to their being read. It was not competent to the members to discuss any question which did not relate to the paper before them.

Mr. ASHTON concluded that the society refused to pass a vote of thanks to Dr. Mac Cormac. *Lancet*, May 1, 1863.

Foul air is a genus of which rebreathed air is merely one species out of many.

The objectors did not distribute their middle term. They seem all unaware of the force of reasoning by the method of residues or exclusion, in other words exhaustive reasoning or reasoning by elimination. Nevertheless, *habemus confitentem reum*, as wise Cicero says. Let them but make a clean breast of it, acknowledging their error, and very gladly shall I condone their logical misprisions and social shortcomings, and esteem them brethren indeed.

In other respects, if I be not indeed the first to proclaim that foul air is the general cause of consumption, I claim to be the very first to prove it. Quite a number, it is true, have ascribed consumption to foul air. But if they did, they admitted and do still admit other utterly irrelevant and imaginary agencies as well. If one cause, however, be solidly established, it is at once illogical, contradictory, and absurd to seek for any other.* To do so is simply to ignore the matter in hand. Foul air, indeed, induces consumption. But I have proved, or assume to prove, that prebreathed air, air loaded with the burnt carbon waste, contains the very foulness that, being again respired, alone induces consumption, a most vital distinction and one which my opponents of the Medico Chirurgical Society entirely failed to appreciate. And as for the formation of tubercle from, or rather its identity with, the unconsumed metamorphic carbonaceous waste, they likewise took not the slightest notice.

As first promulgator, then, of an infinitely important physiological and pathological truth, I cannot without protest and contradiction suffer my meaning, plain enough one might suppose, to be misrepresented or misstated. For all right theory is guided necessarily by true thought, by thought which corresponds with facts instead of diverging from them. My theory is founded not only on direct observation, but on exhaustive reasoning and pathological analysis. Its base is as

* Car toute la saine logique est reductible à cette seule règle, former toujours, la plus simple hypothèse compatible avec l'ensemble des renseignements obtenús. Comte, *Catéchisme Positiviste*, p. 47.

a base of adamant, and bears I submit on the face of it the criterion of all truth, all relevancy, in that it is coincident with known and established law, law the opposite of which is at once inconceivable contradictory and absurd, law in the fixing of which nature has left herself or us no possible alternative.* It needs clear discernment and introspection to discern hidden truth. We are or we should all be prompt enough to perceive how clear a thing is when it is once known and established, but are slow, indeed, to admit how vague and shadowy it is until then.

Multitudes of our hapless species are hurried to destruction by the ravages of an utterly preventible and therefore wholly avoidable disease. The exact nature of tubercle, its identity with the unconsumed metamorphic waste, had never been declared, by other than myself, from the origin of time till now. After I had read my paper, announcing these so important truths before the Physiological Section of the British Association at Glasgow, on which occasion Professors Retzius and Kolliker among others were by, Professor Bennett objected that foul air could not occasion phthisis, inasmuch as the workers at Montfaucon, the general knackers yard at Paris, he stated, enjoyed excellent health. I admitted the fact but controverted the inference. The professor, here, did not distribute his middle term. For, as I then and there rejoined, it was only fouled, in the sense of rebreathed, air that induced or could possibly induce tubercle. Not merely the workers at Montfaucon,† but also the London nightmen, maugre the foul and evil odours which they otherwise endure, well fed as they are and living much out of doors, are mainly a healthy race. Stenches, merely, however otherwise revolting, unless they involve rebreathed air, will not, as I stated then and repeat, now, induce tubercle. For no air is competent to this except already respired air, air defrauded of its oxygen, in fine, air loaded with matters effete and irrespirable as derived from the outpourings of the living

* Ferrier, *Institutes of Metaphysic*, Ed. and Lond. 1854, p. 19.

† Ils portent tous les caractères de la santé la plus florissante. Parent Duchatelet, *Hygiène Publique*, Tome ii, p. 227.

organism. Through the courtesy of the members, I addressed the London Medical Society on the subject of the *Preventibility of Consumption*. I also read before the College of Physicians in Dublin a memoir, *On Tubercle and its Genesis*. Neither of these elicited any particular expression of assent or dissent. But in respect of my essay, *On Tubercle*, read, but not in person, before the Medico Chirurgical Society of Edinburgh,* the President expressed himself favourably in respect of its general tenor and said that many facts were favourable to the hypothesis. I twice addressed the Surgical Society, in the Dublin College of Surgeons, in the first instance, extemporaneously. On the second occasion, not being present, Dr. Benson was good enough to read my written address, *On Certain Vital and heretofore undetected Relations subsisting between the living Organism and the outer Atmosphere*. Mr. Richardson in his after comments seemed to imply that entozoons, rather than tubercles, were developed in shut up rabbits. Cyanosis and emphysema, he thought, bore against my theory. For in these diseases, said he, the blood remains† highly carbonised, and yet the subjects escape tubercle. Nevertheless, if Mr. Richardson would but reflect a moment, he would see, the trivial fact in this instance of the dark colour of the mixed blood in cyanosis, notwithstanding, that life could not be sustained without tissue metamorphosis and the elimination of the metamorphic waste. If they, the subjects of cyanosis and emphysema, inspire prebreathed air they will surely contract tubercle, as I once had occasion to witness, their cyanosis or their emphysema notwithstanding. One of the speakers, indeed, in the face of the terrible prevalence of consumption and scrofula, and the almost universal practice of closing bedroom windows by night, averred that the advantages of pure air and free respiration had long been well known and appreciated. His remarks, however, had no relevancy to my especial views. My object was not, as he seemed to think, merely to enlarge on the benefits of fresh air and free respiration, but to point out how consumption was induced, how tubercle was deposited

* *Edinburgh Medical and Surgical Journal*, July and August, 1856.
† *Dublin Medical Press*, 13th April, 1864.

from the blood, and how it arose from and was constituted by the unoxidised metamorphic waste, not oxidised by reason of rebreathing the same air. This speaker simply failed to understand what was said. And, yet, until people do understand, until medical men shall take up my physiological and pathological conclusions, and generously indoctrinate with them the intelligent public, as well, tubercle, sad fruitage of ages of ignorance and hygienic indifference, must continue to prevail.

I have through a protracted and well sustained series of correspondence,* lectures, conversations, journeys, even, and addresses, done my very utmost to extend and propagate my doctrines. I may not, perhaps, convince every one, but conviction must one day follow insight and the silent constraint of truth. I have had, perhaps, as much success and incurred as little misrepresentation and neglect as I am reasonably entitled

* Belfast, 12 Mai, 1856.

Herr Virchow, Berlin,

Lieber Herr Doctor,—Vergönnen sie mir die Erlaubniss, Ihnen anbei ein Exemplar meines werkes über die Schwindsucht zu senden.

Ich glaube, zum ersten Mal die wahre Ursache des Tuberkels entdeckt zu haben, nämlich das es nur ein Respirationsfehler ist. Beim Einathmen einer bereits wiederholt aufgehauchten Luft wird das Blut nicht hinreichend vom Kohlenstoff befreit, und deiser zurückbleibende Kohlenstoff im Verein mit andern im Blute befindlichen überflüssigen todten Stoffen, bildet die Tuberkel.

Wenn, wie es meine Ueberzeugung ist, diese Theorie gründlich richtig befunden werden sollte, und ich wünsche sehr Ihre geschätzte Meinung darüber zu erhalten, so wird es ein Leichtes sein die Schwindsucht aus der Reihe der Krankheiten auszurotten. In der Erwartung Ihrer sehr werthen Antwort, verbleibe ich, lieber Herr Doctor, hochachtungsvoll.—Ihr Ergebener, Henry Mac Cormac.

Belfast, 20 Fevrier, 1858.

A M. Claude Bernard, Paris.

Monsieur et tres honore Confrere,—Veuillez bien l'hommage d'une exemplaire de mon opuscule sur la phthisie pulmonaire. Je pense bien avoir exposé pour la premiere fois, lá-dedans, la veritable cause de tubercle, et que cela vient d'un vice de respiration. C'est à dire, que quand on respire habituellement une atmosphere prealablement respirée, le gaz acide carbonique n'est pas suffisamment dégagé du sang, et étant retenu avec d'autres excretions, suites de la metamorphose retrograde des tissus, forme avec elles la substance morte des tubercules mêmes.

Si comme j'espere, et comme je crois ardemment, cette theorie se trouve être exacte, car l'haleine de l'homme est mortelle à ses semblables, et une theorie exacte et satisfaisante de l'origine des tubercules n'a jamais été auparavant promulgée, rien ne sera plus facile, en theorie du moins, que de rayer la phthisie du nombre des maladies connues. Je voudrais bien en savoir vôtre sentiment, et aussi si cela se peut, soumettre mes vues à l'examen de l'Académie Impériale de Médecine.

Mon estimable fils, Docteur William Mac Cormac, aura le plaisir de vous presenter ces lignes. J'ai bien l'honneur cher Monsieur et très distingué Confrère, d'être vôtre devoué. Henry Mac Cormac.

to expect. In truth, one must cut trenchantly into the swart columns that sustain the time honoured fabric of error and delusion, penetrate to the very quick the pachydermatous hide of ignorance, stolidity, detraction, and error. Ah, I would proclaim throughout this mighty empire and the world, that consumption, that scrofula, alone owe their origin to air robbed of its oxygen, air loaded with the foul products of the living organism. I would rescue humanity from a mighty ill. I would stay the groans of the malady stricken, appease for ever the pangs of the victims of preventible tubercular disease, and all tubercular disease is preventible.

Never, perhaps, was there a more remarkable instance of recovery from phthisis than that of Isdell the shoemakers son. This youth when he came under my charge, was little more than a collapsed shred of skin and bone, apparently coughing, sweating, spitting, the last poor remnant of his life away. Nevertheless, I made his father wrap him up in warm blankets, and just as if he had been an infant, carry him out of doors twice or thrice daily. He was also kept out of bed in his father or mothers lap, as much as his strength would permit, by the fire. His sleeping chamber, at first a mere stench trap, I had windswept from the upper casement night and day and always. I gave him every available nutriment, wine and steel and vegetable tonics, inclusive. In short, for I mention him elsewhere, he made a perfect recovery. I am the last of my line, C. wrote to me to say, and had made up my mind to perish as my predecessors had perished, of phthisis, for already symptoms of the disease had set in. But, now, he added, coupled with many laudations, for he had carried out all my views, I am well. Dr. Hill, late of Bermuda, told me that when conversing with an English family on the Rhine, he was asked by them if he knew me, for, said they, happening to hear of Dr. Mac Cormacs views we procured his work and carried them out to the letter, and, so, not only regained our lost health and stamina but, relics as we are of a once numerous family all except ourselves carried off by decline, entertain a sanguine hope that we shall enjoy life as long as the generality.

But what signify a few scattered instances of recovery, a

warning or an admonition taken seriously to heart, here or there. They are but as a drop rescued from the mighty ocean of human suffering. And, yet, a day will come when by the means here pointed out, for indeed there are none other, consumption and scrofula shall be haply banished from earths surface for ever. Such are the sure results of a more wholesome rule of living, a closer adhesion to natures law. The needful action of fresh air, as Pettenkofer* remarks, has been known from of old, but why it is needful, thanks to the repeated explanations which I have given, is no longer the secret he imagines. Would, oh would, then, that I might convince not a few but many, not some but all. The profession of medicine is a visible providence for good, and it is at the hands of its members that the suffering perishing multitude now await a too long deferred release. The following excerpts which, under the circumstances it is perhaps desirable to adduce, can add nothing to the certainty of my conclusions, although they may perhaps fortify them in the estimation of those who like to see reason supplemented by a little authority.

'You have accomplished,' observes the late Dr. Robert Gordon, 'a great fact, one which defies and will defy all hostile criticism. I feel I know that your book marks an epoch, believing as I do that you have had the happiness to find out a simple truth, lying as do all important truths before our eyes under an airy veil, the great and important discovery that the detention of carbon in the blood is the cause of tuberculosis and tubercle.' 'I go a great way with you,' writes Dr. Charles Benson of Dublin, 'in your notions respecting the origin and treatment of tubercle, not the whole way, but far enough to influence my practice.' 'There appears to me,' remarks the late Dr. Carlile, whilom professor of anatomy and physiology in the Queens University, 'no doubt, the lungs having to perform so important a function, it stands to reason this being interrupted and the waste not discharged, that it is a very frequent source of tubercle.' 'With respect

* Die Nothwendigkeit, und die Wirkungen der frischen freien Luft sind uns noch vielfach ein Geheimmiss, obwohl die Thatsache von jeher anerkannt werden musste. Ueber die Respiration, *Annalen der Chemie und Pharmacie*, Leipzig und Heidelberg 1862.

to your views on the subject of tubercle,' writes Dr. John Banks of Dublin, 'they have my cordial concurrence. I put one of your recommendations into practice myself, viz. sleeping with open windows.' 'Pray present my respects to your father,' writes Professor Geoghegan, of the College of Surgeons, Dublin, to my son. 'With his views as to the indispensable nature of fresh air I heartily concur. I saw that the London Solons felt their cod liver oil twaddle seriously disturbed by your fathers sound and simple idea. Every practical man knows, beyond a doubt, that fresh air, in scrofula in its several forms, produces more benefit than all our physic.' 'I regret,' writes Dr. Headlam Greenhow, 'that I was prevented the pleasure of being present when your paper was read before the Medical Society, for I should certainly have taken a part in the discussion and probably adduced facts to a certain extent corroborative of the views which you have so zealously maintained.' And, yet, I may here observe, that no one can well sustain my views in part without sustaining them altogether. They are as the serpent with its tail in its mouth or the stones of the arch, and stand or fall together.

Dr. John Simon, of London, remarks. 'Though I can hardly go to the full extent of your belief which, I think, does not make sufficient allowance for hereditary bias to tubercular formation, I thoroughly concur with you in believing that to a great extent this bias admits of rectification.' Sir Henry Holland states. 'Fully in accordance with the excellent suggestions of treatment for incipient phthisis which you have introduced into this treatise, and which I believe to be just, whatever view be held as to the origin of tubercular deposits.' Various reviewers have likewise expressed themselves more or less favourably. 'There can be but one sentiment,' observes the Editor of the *Medical Times and Gazette*, 'as to the learning and sagacity which this accomplished physician has brought to the task. We are grateful that his very luminous arguments are calculated to make us reflect and put our own practice again to the unerring test of experience.' The same journalist again states.* 'Dr. Mac Cormacs theory is simple

* *Medical Times and Gazette*, 18 Dec., 1858.

and ingenious, and quite consistent with the phenomena of the disease.' 'It has been insisted upon,' observes Dr. Copland in his great work,* 'by an able and close observer, Dr. Mac Cormac, of Belfast, that phthisis is not only caused, but also perpetuated by an imperfect supply and insufficient digestion and assimilation of pure air in and by the lungs. Owing to this cause, the carbonaceous and hydrogenous elements are not sufficiently combined with the oxygen of the respired air.' Dr. Reese of New York writes thus.† 'This is the very latest work on the subject, in Great Britain, and we hazard little in saying that it is the best in the English language, alike for the profession and the indoctrination of the popular mind into the most important doctrine of sanitary science, the reciprocal relations of the air and blood, especially in their bearing on pulmonary tubercles, their causation and prevention. So much medical logic and common sense are rarely met with.' In May, 1858, the Imperial Academy of Medicine in Paris appointed M. M. Barth and Cloquet to report on the first edition of this work.‡ It has also been ably translated into German by Hoffmann,§ and into Dutch by Praeger,‖ while my views, those views which find so little favour with some, received on two several occasions notice the most flattering from Virchow in his *Archiv*,¶ Virchow who stands second to no pathologist in the world, exclusive of other French(1) English and German annotations, only some of which I was able to obtain.

* *Medical Dictionary.* Art. Tubercular Consumption.

† Reese, *American Medical Gazette*, New York, Nov. 1856.

‡ Academie Impériale de Médecine, Présidence de M. Laugier, Seance du 4 Mai, 1858. M. Velpeau a deposé sur la table le Traité de M. Mac Cormac sur la Phthisie. Il a etè donné à une Commission composée de M. M. Barth et Cloquet.

§ *Ueber die Natur, Behandlung, und Verhütung der Lungenschwindsucht, von H. Mac Cormac*, M.D. Erlangen 1858.

‖ *De Rationelle Verklaring der Longtering en der Klierziekte*, door H. Mac Cormac, M.D. 'S Gravenhage 1863.

¶ Ein mit grosser Gelehrsamkeit geschriebene Werk, dass überall den nächsten praktischen Zweck der Therapie und Prophylaxie verfolgt — Die empirischen Beweise eine grosse Beachtung verdienen.—Virchow, *Archiv*, xi. p. 120.

Die anregende Arbeit von Mac Cormac, wie schon früher bemerkt, kann der Aufmerksamkeit der Deutschen Practiker bestens empfohlen werden. Die Kapitel über Aetiologie und Prophylaxie enthalten die wichtigsten Bemerkungen. —Virchow, *Archiv*, xv. p. 176.

(1) La respiration continuée d'un air chargé d'excretions, produit graduellement une altération morbide sur le sang. Si cette doctrine est vraie, comme M. Mac

What numbers abide in dwellings replete with every outward element of salubrity, yet coincident with every inward element of decay. On one side all is fresh and pure and life bestowing, on the other all is stale disease engendering and unprofitable. How can it well be otherwise when windows are rarely opened by day, by night never, and where each several interstice through which an undefiled atmosphere might pass, is perhaps papered up or painted over. A number of families are at this moment within my recollection. They divided the air at their disposal into two portions. The foul unrenewed prebreathed indoor atmosphere they kept day and night for themselves, the pure unsullied unbreathed outdoor atmosphere, unhappily, they excluded as carefully. One of these families consisting of young people, their father a medical man, too, had arranged matters so that three sisters occupied, severally, a curtained bed in one and the same chamber. Well, they all three contracted and died of phthisis, and yet they lived in a place of resort where every breeze was redolent of health. One sister, indeed, escaped. But had she only shared the fatal room, she too must have gone with the rest. A brother, fortunately, had gone to sea, and returned brown and bearded the very antithesis of his former self. Similar instances from my own experience or that of others, I might cite by hundreds, by thousands, nay by tens of thousands. Alas, they are witnessed by every one, and they have been witnessed very especially by me. Would to heaven all other practitioners only drew the same inferences from them that I do. If they did, a new aurora would dawn upon the world, and joy bestowing Astrea would indeed return again. Both by direct observation and exhaustive reasoning, I have done what I could to establish and enforce the momentous truth for which I so earnestly plead. Tubercle is a mere *caput mortuum*, resulting from the unoxidised carbonaceous waste,

Cormac aspire démontrer, il donne necessairement droit à la découverte de la vrai cause du tubercule, et du seul traitment rationnel de la maladie. *Gazette des Hopitaux*, Mai. 1858.

. A la suite de l'action imparfaite de la function respiratoire, sujet sur lequel M. Mac Cormac a fait une longue série d'observations et d'expériences, des matières carbonées s'accumulent dans le sang, et transformées en substance tuberculeuse, se deposent dans les tissus. *L'Union Médicale*, 15 Mai. 1858.

deposited in the living organism. There, under the absurd and in fact entirely ridiculous designation of tubercle, applied in utterest ignorance of its real nature by our predecessors, it gathers and festers until by the irritation of its presence and interference with the vital functions it brings life miserably to a close.

How can a rational course of treatment be devised or any general consent thereunto realised, until some better theory of consumption shall be initiated. Now, no theory, to employ a vulgar expression, I submit will hold water except the one which I propound. Snail and vipers broth, asses and even womans milk,* the air of the reeking cowhouse, the lizard, the scorpion,† and the dead felons hand, the royal touch, forsooth, medicated inhalations, sulphuric and acetic acid liniments of ill famed memory, croton oil and tartar emetic ointments, blisters, issues, setons, chlorine and iodine inhalations, arsenious‡ prussic carbolic§ and phosphoric acids,‖ lastly, and considering the nature of the malady perhaps most inept of any, cod liver oil, in drenches within and inunctions without, have been tried and tried without avail. The great general value of iron is justly acknowledged, although alone it can avail little. Nourishing food, change of air, and exercise, severally, have been turned to excellent account. But the successful treatment of consumption involves yet greater energy insight and discrimination than the use, as used, of any of these remedies implies. Jackson¶ commends open air life and effort, highly. He mentions a man far gone in decline who began with chopping wood, in winter too, and, who, continuing to do so every day and all day long, made an excellent recovery. Sydenham, with his usual great sagacity, advises exercise, equitation especially, in the open air. Long journeys on horseback, he tells us, are the best of remedies for cough and consumption, nor does bark, he adds, cure ague with greater certainty than

* Exsugi vero debet e mammis ipsis mulieris, ne quidquam tenuioris halitus, volatilisque principii amittatur. *Burserius Institut.*

† Phillips *On Scrofula.*

‡ Leared, *Medical Times and Gazette.*

§ Crace Calvert, *Lancet.*

‖ Cotton, *Medical Times and Gazette.*

¶ *Letters to a Young Physician.* Philadelphia.

riding does consumption.* The swing, seeing that it entails no outlay and, in virtue of its rushing rapid continuous motion, yields a most pleasant and refreshing open air resort, might well be more employed than it is.† Breaking stones, even, might not be amiss. But outdoor life and action are almost infinitely supplemented by open windows. Open windows, by night, coupled with a low hard yet warm bed, not above sixteen inches from the coverlet to the floor, are of absolute necessity. It is never too cold by night, the body being well protected, to breathe pure unprerespired air. We must take the carpenter into our deliberations in the treatment of consumption, as Strohmeyer did in respect of fever, and see that the casements be removed, or at least made to open from the top. Not to speak of louvre windows there is a method of combining hung casements, as they are termed, windows made to pull down at top, and French windows made to open in the centre below, which is very greatly to be commended. Casements arranged as thus, permit a chamber to be aired thoroughly and constantly. They can also be cleaned, a vast advantage, without risk or difficulty. For light, *coeli spirabile lumen*, is in moment only inferior to air. A mode of combining warmth with effective ventilation would prove a mighty boon. Stove and stove grates might all be made to subserve this desirable consummation, but the section of the air inlets and outlets would have to be made very much larger than any as yet constructed.‡

Last night I happened to look over Fortunius Licetus rare work *De Monstris*, but I saw nothing half so monstrous in this queer old volume as that rational beings should immure their offspring and themselves in airless chambers, so that disease owing to rebreathed air is always imminent and very often at hand. This third day of November 1864, in my sleeping chamber, awakening some hours before the dawn, I found the ever sweet morning air, for the great blessing of which I

* Tantum valere equitationem ad phthisim curandum quantum chinamchinam ad fevres intermittentes. Sydenham, *Opera Omnia Med.*, Geneva 1760.

† Smyth, *Utility of the Swing in Pulmonary Consumption*, Lond. 1787.

‡ Mac Cormac, *Sanitary Economy. Report of the Commissioners on Warming and Ventilation*, Lond. 1857, p. 22.

thanked the Almighty Giver, rippling ceaselessly over my face and person from the two widely open windows towards the equally open door. The stock at the bedfoot is just ten inches, at the bedhead twelve inches, from the floor. My couch is a hard mattress, with a couple pair blankets or so, a counterpane, and a folded plaid occasionally thrown over the feet. The bed itself is situated with the end opposite the windows. When I rise I close these windows and have a hand or moistened towel bath, followed by a course of Irish huck or Russian crash, and for a few minutes exercise with dumb bells or a pair of clubs not too heavy. After all this, the sweet Irish linen surmounted by a Shetland vest feels delicious indeed. I greatly commend going out of doors for an hour or two afterwards, and commonly practise it myself. But if not, pleasant occupation is found at my desk in the interval before breakfast. The habitude of these hygienic observances tends without a doubt to extend life and to put off the period when tissue metamorphosis, itself, comes necessarily to a close. And when the veil, which this wondrous organism interposes between the spirit life and the life that is, falls away, one comes to imagine how much better it would prove, carrying out the good work, not to saddle the city and the homes of men with ones remains, but rather to repose beside some windswept knoll where the lark and the thrush should sing, where the air should be perfumed with the meadow sweet and the bean, and where the wallflower and the honeysuckle, which one so loves in childhood, should cluster round ones tomb.

The Greeks and Romans, though not quite exempt from phthisis, were at any rate vastly freer from it than we are ourselves. The bedrooms round the open court,* exclusive of the open air life, otherwise, yielded, apparently, the freest access to the atmosphere. Our indoor life, indeed, with our close heated rooms, the outer air being carefully and insanely excluded by glazed windows and impervious walls, is quite a matter of modern innovation, for what does nature know of such things. Far from neglecting the body, the ancients pro-

* Αὐλῇ, τοῦ περιτετειχισμένου καὶ ὑπαίθρου τόπου.

vided, in some respects at least, far better for its wholesome conservancy than we do ourselves. And, yet, what is life without health. The bloodiest battles, the direst plagues, rarely entail so great a mortality, were it over the entire globe, as is produced by a single years ravages of phthisis in England alone. Death in the garb of tubercle mows down our young people as the mower mows the swarths of corn. Ah, ponder it well, ye parents, ye who thus make or mar your childrens welfare, insure them good health or ill. By pulling down their sleeping chamber windows or if needful taking them quite out, you make your offspring free of Gods great atmosphere, and render the incursions of consumption and scrofula if not wholly impossible a next to impossible thing. For we should endeavour to recollect with Montaigne, in respect of training and education, that it is not a soul only that we have to deal with, but a man.*

Rush, the sagacious American physician, urged exercise in the cold air, even the exposure incident to campaigning, as beneficial in hemoptysis and consumption. Dr. Richardson, although he do not discuss with me the origin of tubercle, makes nevertheless the important statement or admission that a supply of the pure atmosphere, *alibilis aer*, for respiration, is the first indication in the treatment of the consumptive.† Vigorous exercise and free atmospheric exposure, says Parrish,‡ are by far the most efficient remedies. Blake, dealing with phthisis, tells his patients to live in the open air by day, and, when not hindered by the rain, to sleep in it by night. After adverting to Dr. Morgans account of the Hebrides, where every breath of heaven finds its way indoors, he goes on to mention§ that, although the people in California be so absorbed in money making as to have little time for health seeking, he yet managed to frighten two phthisical sufferers at any rate into passing the winter in Mexico. One of these, he tells us, gained twentysix pounds in two months, the other was much improved. And yet both, Dr. Blake as-

* Ce n'est pas une âme qu'on dresse c'est un homme.
† *Journal of Public Health*, Lond. 1856, p. 262.
‡ *North American Med. and Surg. Journal*, cited by Dr. Richardson.
§ *Pacific Medical and Surgical Journal.*

sures me, had diseased lungs, and one of them extensive cavities. They will pass the summer, he says, in the Californian mountains. And, as they keep journals, he expects to be able to forward me some further particulars in respect of wintering in Mexico. Dr. Blake* describes seven well marked cases of phthisis. Of these, three had advanced to the third stage, and four to the second. Of the first, one stopped midway in the treatment, and, returning to the Eastern States, perished. One had gradually improved, during four years, and gave promise of recovery. The third, a lawyer, had gained in strength and weight, and was able to attend to business. Of the other four two recovered, one adopted wet sheets and died, and the last is going on favourably. In each case living in the open air was as much as possible the most important element of treatment. In all the instances of improvement there was a notable increment of weight.

There is in fact no panacea in Californian air, no peculiar specific for lung troubles.† If we cannot have the summer of California or the winter of sunny Mexico, we possess not the less a climate, whatever some may choose to say against it, replete with almost every possible element of vitality and wellbeing. We have air as pure as any obtainable on Californian or Mexican hills, air abounding in oxygen and ozone, air in short which, if we only do not respire it twice, leads to as perfect security from tubercular disease here as there. Whether in California or in Mexico, when the air respired is robbed of its proper complement of oxygen, and further surcharged with foul watery vapour and respiratory soil, the arrested carbonaceous waste will be deposited within the bounds of the living organism, just as quickly and as surely as under like circumstances, it is deposited, here. Nowhere, so long at least as people conform to natures rule and natures law, are rosier cheeks or more perfect forms to be witnessed than our own. Nay, the very coldest regions, as thus, are free from tubercle as the most temperate. A physician in Quebec‡

* *American Journal of the Medical Sciences.*
† *The Era*, San Francisco, 27 Nov. 1864. p. 1.
‡ *Quebec Medical Journal.*

sent his consumptive patients to winter of all places in the world, in Labrador, and, yet in Labrador, by dint of outdoor life and effort, they regained their missing health and stamina. But, anywhere and everywhere, it needs only that men should be convinced that prebreathed air alone induces tubercle, and that air not prebreathed does not induce it, in order to remain exempt from it for ever.

It is at once curious and interesting, and would at the same time be humiliating, did we not know that it was the law of our psychical nature, how slow proves the progress of discovery. The true, the *vera theoria*, however simple obvious and demonstrable, is entertained slowly and hesitatingly at first. The mind, even in energetic and perspicuous thinkers, moves in grooves of its own. Like the gold digger who sinks his shaft close by some precious ingot, without coming on it, the thinker will oftentimes graze on the very borders of discovery without being for a moment aware of the precious treasure that lies so nigh, and, yet, for ever beyond his reach. A genius more comprehensive at no time adorned a profession than that of Albert Haller. A greater physician in the widest best sense of the term, indeed, there never breathed. His attainments were prodigious, his industry was untiring. All Europe vied in tendering him well merited homage. His achievements in the domain of physiology, alone, mark an era in our time. And yet, Haller, though he fully admitted the atmospheric deterioration induced by the act of respiration,* had no more accurate conception as to the nature of that deterioration and its baneful consequences, than had or unhappily have, the great majority at the present day. Would only that he yet survived, so that I might tender him, as I now tender his memory, the homage of my discovery.

Many pathologists as well as Bayle,† deemed phthisis incurable. And, yet, no wonder that Bayle did so, seeing that he was unaware of its real cause, its most certain potential arrest and prevention, and possible cure. How should people in his

* Verum respiratio, sive immisto vapore subputri, *sive alio quocunque modo*, certo vitiat aerem et ineptam reddit. *Primae Lineae Physiologiae*, Edinburgi 1767, Section cclxxxi.

† *Recherches sur la Phthisie Pulmonaire.*

time, any more than ours, recover from phthisis when permitted to respire no air except more or less already respired air, and, consequently, are exposed to the very influence which as I insist alone produces the disease. Bayle, indeed, esteemed phthisis incurable, nevertheless, he admitted that he had seen persons who for many long years had laboured under it. Andral* describes cases of the cicatrization of caverns after the evacuation of tubercle, also the calcification or calcareous conversion of tubercles themselves. The healing of tuberculous excavations, says Forbes,† is unquestionable. The tendency of tubercle, observes Marshall Hall,‡ is always destructive, but that it has been prevented, in some instances, and cured in others, is undoubted. By ascertaining the causes of phthisis and the way they act, observes Copland,§ we shall avoid or counteract them. The evidence of spontaneous cure, repeats Hugh Bennett,‖ is frequent in pulmonary tuberculosis. The testimony of Stokes¶ is the same. As medicine, he remarks, advances, the cure of consumption will be more frequent and its nature better understood. What Bayle looked upon, and termed a form of phthisis, *phthisie calculeuse*, was in fact no other than an example of its cure.

Although Andral and Reynaud assert that cavities seldom, and Louis(1) that they never heal, yet, Rogée,(2) Laennec, Rokitansky, Fournet,(3) Boudet, Gluge, and others, all testify that they often do so. Bene,(4) likewise, writing in the latitude of

* Nous en avons rencontré plusieurs cas, et nous admettons avec Laennec que la cicatrisation des cavernes pulmonaires peut avoir lieu. *Cours de Pathologie Interne*, Paris 1837, Tome Premier, p. 435. Nous avons vu des individus qui, après avoir présenté tous les symptômes rationnels de la phthisie, ont gueri, et sont morts beaucoup plus tard. A leur autopsie, nous avons trouvé des concretions calcaires au sommet du poumon. *Id.*

† *Translation of Laennec*, 4*th Ed. p.* 289. ‡ *Principles of Medicine*, p. 53.

§ *On Consumption*, p. 181. ‖ *On Pulmonary Tuberculosis*, p. 6.

¶ *On Diseases of the Lungs*, p. 438.

(1) *Recherches Anatomico Pathologiques sur la Phthisie.*

(2) Essai sur la Curabilité de la Phthisie Pulmonaire, la Transformation des Tubercules, et la Cicatrisation des Excavations Tuberculeuses des Poumons. *Archives Générales de Médecine*, Paris, 1839.

(3) *Recherches Cliniques sur l'Auscultation, et sur la Phthisie Pulmonaire.* Paris 1839.

(4) Relate ad prognosim pertinet phthisis inter morbos periculosissimos. Non obstante hoc mortalitate phthisis tamen curabilis est. Non raro per solam autocratiam naturae, saepius per therapiam rationalem sanatur. Bene, *Elementa* Med. Pract. Pestini 1834, Tomus iv., p. 275.

Hungary, asseverates that, whether through natures autonomy or the judicious efforts of art, phthisis is many times curable. Could we only examine every tubercular subject after death, how often should we not discover tubercular cicatrices, in fact so many evidences of cure, in the lung apices.* How many, in truth, would presumptively recover with the adoption of more suitable measures. How often are natures efforts thwarted by errors of living and inappropriate treatment. As Laennec, although a man of genuine talent, knew not the *vera causa* of the malady, and, consequently, could not successfully cope with it, whether in his own case or the cases of others, so his comments† on the helplessness of art, medical art at least as he knew it, really go for nothing. The arrest, the only true arrest, of phthisis, is the arrest of further tubercular deposits, leaving nature aided by human skill, an opportunity, if the case be not hopeless by reason of too long delay, of dealing with those already formed. Air not prebreathed, as it is the best because the only prophylactic, so is it also the very corner stone and fulcrum of all effective treatment.

That phthisis, observes Gluge,‡ is capable of being healed, is established by the evidence of morbid anatomy. Pathological anatomy, indeed, coupled with the observation of the living man, leaves no colour of doubt on the subject. Tubercle of the lungs, then, in most of its stages, whether in large or small masses or in the resultant caverns, thus strangely named, is more or less remediable. Recovery, however, is vastly more practicable at an early period than subsequently. The healing process may show itself in the absorption of the carbonaceous ingredients, in chalky conversion of the body of

* Redfern, *Abnormal Nutrition in the Articular Cartilages.* Edinburgh 1850, Obs. vii.

† Nous avons prouvé que la guérison de la phthisie n'est pas au dessus des forces de la nature, mais nous devons avouer, que l'art ne possède encore aucun moyen certain d'arriver á ce but. *Traité de l'Auscultation Médiate,* 2 ième Partie, Art. vii.

‡ Die Heilbarkeit der Tuberkeln der Lunge ergiebt sich aus den anatomischen Beobachtungen von Laennec, Carswell, Rogée, Fournet, Andral, Cruveilhier, Bennet, Rokitansky, und mir, nur dass nicht alle über die Stadien einig sind, in denen eine solche Heilung zu Stande kommen kann. Dies Resultat, eins der wichtigsten der pathologischen Anatomie, kann jetzt bei Lebenden oft eben so sicher constatirt werden, wenn neben der gewöhnlichen klinischen Untersuchung auch die mikroskopische der Sputa angestellt wird. Gluge, *Atlas, Vierte Abtheilung,* Section 8.

the tubercle, in the evacuation of purulent matters, in the substitution for the tubercle itself of a serous cavity, and in the contraction of the cavity and formation of a firm cicatrix. That tubercle of the lung heals, follows from the conjoint observations of Laennec, Carswell, Rogée, Fournet, Rokitansky, my own experience, and that of Gluge himself. This infinitely important conclusion, then, is, in every way, sustained by clinical observation and microscopic research.

Urged by the profoundest conviction, I have earnestly insisted on certain laws and sequences, in connexion with respiration, hitherto undiscovered and unknown. I have proved, I trust, to the satisfaction of all who will be at the pains to follow up this argument, that rebreathed air stays the combustion of the metamorphic waste which, consequently, and under no other circumstances, whatever, is deposited in the living tissues of man and brute. Taken at a sufficiently early stage this deposit, I have shown, may in some instances, at least, be removed, and with absolute certainty, and in all cases, arrested and prevented. The remedy, which, speaking of tubercular phthisis, always prevents, which always arrests, and if sufficiently early resorted to, would often if not always heal, is, as I have established, the respiration of unprebreathed air. But as the disease, in too many instances, unhappily, is firmly fixed when brought under the physicians notice, I would urge, in the most forcible terms that language permits me to embody, the universal adoption of preventive means. Curative measures are uncertain, but preventive measures, as here advocated, cannot fail. For, gracious heaven, what remedy is to deal with aggravated inveterate structural change. Diseased or worn out lungs are not to be replaced by new. When the matter of tubercle is heaped up in the lungs, or scattered throughout the organism, when the delicate structure of the air cells is invaded, becomes indeed no better than a vile conglomeration of decay and rottenness, how is it possible to retrieve ruin so great. The thing is impossible. Alas, it cannot be done. The empiric may boast his placebos, the man of science may tax the resources of the healing art, but not the less does the malady bear off the sufferer to the grave. And, yet, nettle and dock,

bane and antidote, beside each other grow. Prevention, indeed, is better here than cure. If I knew any words or form of entreaty, as calculated to incite to prophylactic action, more potent than another, I would resort to those words, to that entreaty. The only right way to deal with tubercle, as with its whole accursed brood, is to prevent it. I am hopeless utterly of other efficient means. Our successors, assuredly, one day, will point back with amaze to the ravages of consumption, as we now point to those of the black death, cholera, smallpox, plague, and other horrors of the past. In truth, we have in prevention, as here set forth, means happily certain and triumphant, as cure, at least attempted cure, too often is uncertain and disastrous.

So long as science lasts my theory must stand. Carried into action, it will yet rescue uncounted millions from protracted wretchedness and a living death. It will help to elevate the physical status of our kind, and, graven on a medium, haply more imperishable than the poets monumental brass, shall long subsist in the appreciation of an intelligent and, fortunately for themselves, acquiescent posterity.

PRELIMINARY REMARKS.

For generations phthisis has been the opprobrium of medicine. No disease, perhaps, has been more patiently investigated, yet none has oftener baffled inquiry, or has been more extensively abandoned to empiricism and despair. Now, it is my object to show that the subject of phthisis may be cleared up, that its nature and origin can be demonstrated, and that a rational system of treatment and prevention are to be laid down.* I can and do assert, without any colour of doubt or hesitancy, that the malady which constitutes nearly a third of all chronic diseases, and perhaps from a fourth to a fifth of the actual mortality of the human race,† may be brought into narrow limits, if not entirely set aside. If society, if medical science, were on a proper normal footing, the multitudes now cut off by consumption would no longer perish in what might else prove the very fulness and vigour of their prime.‡ From researches by the Count de Chabrol, at Paris, the greatest mortality is between twenty and thirty years of age. The mortality, he asserts, is fifteen per cent greater among males than females, and nineteen per cent more fatal in towns than in the country. In the Edinburgh Infirmary, from 1833 to 1837, there were one hundred and fiftyfive male, and sixtythree female cases, while, in a total of one hundred and nine cases of phthisis in the Hôpital Cochin, there were one tenth more males than females. Louis, however, had seventy female and fiftyseven male cases in wards of fortyeight beds equally divided among the sexes, while Benoiston de Chateauneuf declares that there is a great excess of consumptive females over consumptive males in the Paris hospitals.

* S'il est possible de perfectionner l'espèce humaine, c'est dans la médecine qu'il faut en chercher les moyens. Descartes.

† Inter chronicos φθισις duos fere trientes jugulat. Baglivi.

‡ Cum hic morbus aetate firmissima maxime oriatur, id est ab anno duodecimo ad annum quintum et trigesimum. Celsus, *De Med.*

Phthisis, together with its history and symptomatology, has been described even to its very minutest detail, but little if anything, hitherto, such have been the absurd and contradictory views entertained with regard to its real nature and origin, has been accomplished in the way of prevention, or in the abatement of the enormous and almost incredible mortality. It is time, then, that the disease should be looked at from a loftier truer point of view, and subjected to a more searching and more patient investigation.

It is worthy of remark that the man to whose penetration and sagacity the world is so largely indebted for the more correct discrimination of the signs and symptoms of diseases of the chest, without a doubt as he states the most frequent of any,* was so utterly unaware of the proper mode of guarding against phthisis, as to fall a sacrifice to the malady. He is but one, however, of the many who in the medical profession, itself, have fallen victims to consumption.

I cannot agree with Bacon, that medicine lies wholly in observation.† It ought to be observation, doubtless, but then it must be observation coupled with rational inference and sound induction. If observation alone had sufficed, we should not still have occasion to witness the insatiate ravages of phthisis, not only among the poor and miserable, but also among the intelligent, the wealthy, and the refined. Consumption, with all its frightful train, is simply and truly and only a violation of the physical laws of our material being. Scrofula, wisely observes Baudelocque, is commonly if not always, the result of an infraction of some hygienic law.‡ What he asserts of scrofula is equally true with respect to phthisis. Here, as in other instances, medical men must lead the way to the better appreciation of those hygienic laws. Medicine, indeed, must be studied by the light of experience, but we have also to add the light shed by a yet loftier science, the science which coordinates not merely medical philosophy, but the universal principles of all philosophy. The world, indeed, desires to be

* Sans contredit les plus frequentes. *Traité de l'Auscultation Médiate.*

† Ars medica tota in observationibus.

‡ Très souvent pour ne pas dire toujours, la maladie scrophuleuse est l'effet d'une infraction prolongée des loix de l'hygiène.

informed on all points, *des clartés de tout*, as has been said. It will require of medical men, as of others, a reason for the faith that is in them. Nature, in truth, is sparing in causes, but she is exuberant in results. If Van Oven and Flourens, in their works on human longevity, be correct in estimating the natural duration of mans life at one hundred years in the words of Flourens,* the actual duration of human life, or some twenty years for the poor and forty for the rich, argues a prodigious amount of social ineptitude and of short sighted arrangements. The more general study of science, physiological science inclusive, at once by medical men and the more intelligent members of the community, at large, would tend to supersede the unhappy results which flow from a narrow spirit of detail, and the evils which accrue from the absence of all great and true generalisation. In fact, nonsense, too often, has held the place of sense, and nescience of science, itself.

ON THE NATURE OF CONSUMPTION.

Sir James Clark, in his treatise on Pulmonary Consumption, after stating that a third of the mortality in England arises from tuberculous disease, proceeds to add that in proportion as the practitioner is acquainted with the exciting causes, so shall he be enabled to treat successfully the cases which come under his care. One of the first things, then, to be considered in the investigation of consumption, is the immediate source of the symptoms which bear the name. To this my unhesitating reply is that these symptoms are owing, and only owing, to the irritation created by tubercle in the tissues and in the blood.† What, then, is tubercle. It is, in fact, a foreign body, in short a dead extraneous substance, that has no business to be present, obtruding itself into and among the blood and general tissues, and, when in the lungs, constituting phthisis, or, in other words, consumption of the lungs. From what Hippocrates observes in his Prognostics, he would seem to have been aware of the identity of tubercle

* Un siécle de vie ordinaire.

† Sanguinis dyscrasia et prava ejus indoles materiam alibilem pervertit. *Burserius, Venetiis*, 1817, Tome vii., p. 79.

and consumption,* a thing, strange to say, hardly appreciated till the time of Stark, only some sixty years ago, the prevalent English opinion being that consumption was simply ulceration of the lungs, and hemoptysis, though in fact a result of tubercle, the mere bursting of a bloodvessel. The views of Aretaeus were less advanced. In his book on Chronic Diseases he ascribes consumption simply to abscess of the lung or spitting of blood.† The conclusions of the Arabian physicians appear to be simply borrowed from the Greeks. Their opinions, indeed, or those of any of our predecessors, may not perhaps be of much direct importance, but at any rate they are of interest in relation to the development of human observation and human thought, which followed the same laws in those days as in these, as well as of the history of human errors which were just as characteristic then as now.

Tubercle, crude tubercle, has been compared to decayed cheese, to which, in the cheesy stage so named, at least, it bears no inapt resemblance. Tuberculous matter, by its presence in the blood and in the tissues, constitutes alike the essence of consumption and of scrofula. As to the fundamental identity of phthisis and scrofula, there cannot be any rational diversity of opinion. There is this to be said in respect of tubercle, that it is entirely a foreign and unnatural product, occurring, in virtue of a universal law of disease, in all warm blooded creatures when placed in the circumstances which generate it, and having no possible presence or existence, whatever, in a sound and healthy state of the solids and fluids. Tubercle, I repeat, has no normal existence, anywhere, and only makes its appearance as the result of a profound and deeply seated degradation in the vital functions of man and animals. Consumption, then, is owing to tubercular lung deposits, and to that superinduced state of the constitution which leads to and follows such deposits.

In pulmonary consumption tubercle is deposited in the lungs, but very often in several organs, concurrently, as the lungs larynx liver bronchial and mesenteric glands. It is

* Οἵσι δ' ἐν πλευμονι φυματα γίνεται.

† Αποστάσιος ἐν τῷ πνεύμονι, ἢ ἀναγωγῆς αἵματος.

easier to say where it is than where it is not. Tubercles subsist in one lung commonly to a very much greater extent than in the other, and, preferably, though far from always, in the upper and back portion of the lobe. The immediate seat of tubercle, according to Carswell,* is the dilated air cells and bronchial terminations. Doubtless, this is so, at first, but subsequently, and I speak from careful observation, hardly any tissue is respected, and parenchyma and bloodvessel, bronchus and cell, are alike destroyed or displaced by the encroaching invader.† Tubercle occurs as an exudation or effusion out of the vascular system, taking place almost imperceptibly alike to the patient and the onlooker. Tubercles, themselves, may be many or few, and vary in size from a pins head to a walnut. They soften and are discharged through the contiguous bronchus, the cavity remaining open or perhaps lapsing into other cavities. In a certain number of instances, the cavity heals up by an effort of nature which would oftener terminate in recovery than it does, were it not for the deposit of fresh tubercle, unless when happily the tendency to such fresh deposits is overcome. Tubercle may also dry up by a continuous process of absorption and of waste mineral deposit, and is converted into a cretaceous mass, the calculous phthisis of Bayle, which, in effect, is no other than an effort of nature at cure. Sometimes, oftenest indeed, these cretaceous masses are only discovered after death, at others they are expectorated during the lifetime of the individual. They have been adverted to by Aretaeus Morgagni Boerhaave Portal Laennec Louis and very many others more recently.

The presumptive existence of tubercle may frequently be inferred from the general aspect and condition of the patient, the rational as well as the physical signs. Both these classes of indications, however, are occasionally uncertain, and for this and other reasons are best combined. The aspect of a patient labouring under phthisis is indeed quite peculiar. The disease is seen, more or less, in the gait, countenance, expression, complexion, voice, cough, respiration, the manner of getting

* *Cyclopedia of Practical Medicine.*
† Rokitansky, *Pathological Anatomy*, Vol i. Swaines tr.

up and sitting down, the pulse. For, indeed, every tissue and function, every fluid and solid, labour little or much, more or less, under the complaint. Scores and scores of times have I diagnosticated the existence of phthisis before the patient has so much as spoken a word or emitted a sound.

Language, in truth, has been exhausted in describing the malady, ingenuity in detailing the physical signs. Of the numerous and able inquirers, both in our own and other countries who, after the great French observer, have made the signs of phthisis their peculiar care, Skoda holds a high place.* His treatise merits the attention of every one who would do justice to the important subject of which it treats. In respect of Skodas explanation of variations in the strength and resonance of the voice, however, in virtue of a consonance within the thoracic cavity, Professor Wintrich of Erlangen conceives that he has gone to an unnecessary, and in fact, erroneous extreme.† And, here, I must particularly observe that the sounds of a lung containing a few solitary or scattered tubercles do not necessarily differ from those of the healthy lungs. In short, tubercles do not always afford a physical or even a rational sign. This important fact is distinctly affirmed by Skoda Andral and others. It is owing to the circumstance of its being overlooked that many have been pronounced exempt from tubercles who really laboured under them. In fine, the stethoscope is not, in fact, the criterion which the public and even the profession are wont to imagine. I have often met cases of evident phthisis, evident at least from the rational signs, in which neither auscultation nor percussion, at least in my hands, sufficed to declare the existence of tubercles. We cannot, then, as Weber‡ assures us we may do, infer the non-existence of tubercle simply from the absence of the physical signs. When these, then, are deficient or absent, or when the practitioner as Stokes judiciously observes has not entire confidence in the physical signs, he should look so much the more attentively to the rational or vital signs, the streaky gums, the

* *On Auscultation and Percussion.* Markhams tr.

† Einen unnöthigen Missgriff. Virchow, *Handbuch der speciellen Pathologie*, B. v., S. 139.

‡ *Handbook on Auscultation and Percussion.* Cockles tr.

incurvated nails, the clubbed finger ends, the habitually quickened pulse and respiration, the expectoration, whether hemorrhagic purulent or even tuberculous, the chests diminished air capacity, the sweating diarrhoea and hectic, the loss of weight muscular firmness and muscular strength. It is, indeed, a momentous error, entailing serious loss of time and opportunity, to assert the absence of phthisis merely from the latency or obscurity of the physical, overlooking or neglecting the rational vital signs, which, even themselves, are not always by any means so conclusive as could be desired. The public, however, are many times themselves to blame for extorting, as they are often wont to do, from practitioners a certainty and a positiveness of diagnosis which the circumstances of the case do not yield.

THE CONSTITUTION OF TUBERCLE.

What is tubercle. It is an unorganised, a dead deposit, which may take place at any and every point of the organism, the cartilaginous epidermoid dental and one or two other formations, perhaps, excepted. Wherever capillaries subsist, whether in the common vascular organs or in new tissues, there, tubercles may present themselves. Certain vascular textures, however, the muscles very particularly, are comparatively more exempt than others. The bones themselves are not free, although tubercle in bones had been too long overlooked. Even the small blood vessels are liable to diffused tubercular degeneration. To this, indeed, Hall justly ascribes the early hemoptysis which so frequently ushers in incipient phthisis.* The lungs are an especial seat of tubercle, so much so that whenever tubercles occur elsewhere, it is to be presumed that they also subsist in the lungs. This, or Laennecs law, however, is not quite so absolute as Laennec supposed.

The composition and constitution of tubercle, from whatever part of the body derived, at whatever age, and whatever be the animated being which is the subject of it, is essentially the same. It consists mainly of a hydrocarbon and, in case of

* *British and Foreign Medico Chirurgical Review*, April 1855, p. 493.

obsolescence and calcification, of certain added mineral waste, circumstances of great moment in respect of arriving at a more definite knowledge of the nature constitution and ultimate disposal of tubercle. There is tubercle, proper, deposited we shall say in the compound or many nucleated cells, as described by Virchow and Van der Kolk, and, then, there is the adventitious fatty matter so often incorporate with it. But this fat, itself, is almost a pure hydrocarbon, and may perhaps be also looked upon as a form of the unoxidised metamorphic waste. It abounds so in tuberculous liver as by Louis and others to be termed fatty degeneration of that organ. The fatty, is coupled with the tuberculous matter, and is freely yielded on compression between folds of bibulous paper. Guillot,* moreover, asserts that the dried parenchyma of tuberculous lungs contains from forty to fifty per cent of fat associated with tubercle. It is, however, stated by Scherer† that crude pulmonary tubercle, divested of foreign ingredients, and containing little fat or extractive, yielded in one hundred parts, fractions omitted, fiftyfour parts of carbon, seven of hydrogen, of nitrogen seventeen, and of oxygen twentyone. Tubercle, then, is not a fixed or definite compound. But that carbon, waste carbon, at any rate, is the solid predominant ingredient, is shown by direct analysis as well as by the concurrent testimony of all observers. Nothing can possibly be more conclusive.

RATIONAL OR VITAL CAUSE OF TUBERCLE.

Before we had become so familiar with them, tubercular deposits and their results in different parts of the body, as the spine bones joints brain mesenteric glands lungs, were looked on, and indeed treated, as essentially distinct complaints. These deposits must now, however, be considered ramifications of one great malady, under varying aspects and manifestations, as arising from the retention in the system of the unburnt metamorphic carbon waste. The pathology of one class of tubercular affections, indeed, is mainly the path-

* *Comtes Rendus.* † *Animal Chemistry.* Simons tr.

ology of them all. For though we cannot well determine the principle of election, in no instance and under no circumstances, whatever, will tubercles be deposited in the absence of the tubercular temperament, itself. This is a truth, as it seems to me, of the very last importance. If we keep away the tubercular temperament, we also keep away tubercle. If we permit the encroachment of the tubercular temperament, we likewise invite the encroachment of tubercle. One, we cannot have without the other. They are as substance and shadow, as cause and effect. They follow, one the other, in inevitable and unvarying sequence, as gravity follows or rather attends, the presence of matter. This is no idle or illusory distinction, but a great pathological fact. Neither inflammation, nor colds taking, nor starvation, nor inferior nutriment, nor dyspepsia, nor chills, nor deficient clothing, nor excessive moisture, nor low spirits, nor bodily inaction, nor the suppression of eruptions, nor the retention of habitual discharges, nor exhaustion, nor abuse of mercury, nor intemperance, nor supposed hereditary tendencies, will, in any case, lead to phthisical or scrofulous deposits, if there be not a tubercular habit of body, a scrofulous cachexy or dyscrasis, term it as we will, to superinduce them.

It is even yet believed that consumption is communicable. And such, indeed, was the opinion of Forestus,* and of very many along with him. The clothes and bedding belonging to consumptive sufferers are actually destroyed in the South of France, where people dread consumption more than they do the plague, so that poor English sufferers often find it difficult to obtain personal accommodation. Even the judicious Joseph Frank speaks of the slow communication of the disease.† But in truth Morton, Morgagni, and others, maintained this opinion now comparatively exploded from the domain of rational pathology. Consumption is not communicated by any infection or contagion, whatever, any more than a fractured limb is so communicated. It may very well happen, however, that persons subjected to the same deteriorating influences, shall in succession be seized with phthisis, so that the same cause

* Contagiosa est. † Lentam communicationem morbi.

operating, whole families shall be carried off by it. This it is, which has led to the belief not only of the communicability of phthisis, but also of its transmissibility in families. Thus, we see mothers seized with phthisis after nursing consumptive sons and daughters, sisters after having waited on sisters, brothers after succouring brothers. Exposed to a like rebreathed atmosphere, they thus contract consumption and perish, giving rise to the quite illusory prepossession as to the communicability and transmissibility of the disease itself.

Until recently, no opinion, perhaps, was more generally entertained than that of the inflammatory origin of phthisis, or as it was also termed, ulceration of the lungs.* A more sound pathology, however, now prevails, and this medical error, like other cast off things, has descended to the people. The consumptive patient, when he consults a medical man, is generally prepared to tell the how and the when of the pleurisy or the cold to which his malady is ascribed. Sometimes it is a wetting, at others lying in damp sheets or sitting in damp clothes, otherwise bad enough in their way, that has to bear the blame. Broussais was a most decided advocate of the inflammatory hypothesis. As fever was with him a gastro enteritis, so, consumption was the result of an inflammation of one of the thoracic viscera, in short a chronic pneumonia, and more especially a chronic pleurisy.† This opinion of the inflammatory origin of consumption, however, has a very respectable antiquity. Galen in his Book on Definitions, indeed, refers phthisis to ulceration of the lungs or thorax or fauces,‡ although in his Commentary on Hippocrates, he ascribe it to effusion of blood in the lungs, and between the lungs and thorax. Broussais, it is true, discovered tubercles in false membranes after chronic pleurisy, just as he might have and

* Cujus ulceris origo deducitur ab omni causa quae valet sanguinem in pulmonibus ita sistere, ut in materiem purulentam abire cogatur. Boerhaave, *Aphorismi*, Phthisis Pulmonalis.

† C'est dans l'age des inflammations pectorales que les hommes craignent la phthisie, c'est en se préservant de celles-là qu'ils se soustrairont à celle-ci. Mais des toutes les inflammations pulmonaires, c'est celle de la plèvre qu'il importe le plus d'anéantir dès le moment de son origine. *Histoire des Phlegmasies Chroniques*, Tome. ii., p. 144.

‡ Ελκωσις του πνεὺμονος ἤ θώρακος ἤ φάρυγγος.

did discover them in the normal tissues. Doubtless, when tubercles already subsist, inflammation proves a great aggravation, but it will not *per se* induce tuberculisation. And although tubercle, as Andral and Rokitansky observe, may prove a sequel of inflammation fever and other maladies, still, such sequel is incidental not sequential even in persons already labouring under tuberculous deposits. Alison relates the case of a boy of five who died of enormous tuberculisation of the bronchial glands, yet this same boy* presented not a single tubercle in the lungs, although he had laboured under intercurrent pneumonia. In a case of *tabes mesenterica*, with fatal intercurrent pleurisy, I could not detect a tubercle in either lung. Inflammation, then, in the order of cause and effect, will never lead to tubercle.

Hereditary phthisis, observes Herman Boerhaave, is the very worst.† This, or something like it, even now, is a very general persuasion. Dr. Thompson, of the Brompton Hospital, considers hereditary influences strongly marked. Out of a thousand patients one fourth, he says, had lost a parent from consumption. Louis, however, states that he could only ascertain that one phthisical person in ten was born of parents who had died of phthisis. If we consider the very great frequency of phthisis, it will not appear that these ratios are very striking. It does not at all follow, because a person has had phthisis, that his or her offspring must needs contract it. Nor does it follow, when the offspring of a phthisical individual are attacked with phthisis, that the phthisical tendency is hereditary. For no one will or can contract phthisis, whether the parents be phthisical or not, who does not habitually respire prebreathed air. At this very moment, I am acquainted with individuals in the enjoyment of perfect health, whose predecessors on either side had laboured under phthisis. How many are there who die of phthisis, none of whose parents ever were affected with it. Tubercle, otherwise, is rare in the new born, so rare, indeed, that although instances of incipient congenital tubercle have been pointed out by Langstaff Husson Dupuy Papavoine Rufz and others, the occurrence may be practically regarded

* *Transactions of the Edinburgh Medical Society.* † Omnium pessima.

as non existent. Persons born of the healthiest parents, let us be well assured, become tuberculous after sufficient immersion in prebreathed air, and persons born of parents the most unhealthy, will never become tuberculous unless exposed to such air. Phthisis, I assert, is absolutely within our control. No one, in fact, need now incur consumption, whether in themselves or in their offspring, who does not choose it.

The one and only possible source of the tuberculous cachexy is twice breathed air. Let us only breathe long enough and often enough the same air and the deposit of tubercle in one organ or many organs will prove the unfailing result. When tubercle is external it is commonly termed scrofula, when it is internal, the name varies with the seat. But internal and external tubercle are often concurrent, and always the same. Francis de la Boe or Sylvius, professor in the 17th century at Leyden, it is said, was the first who asserted the identity of phthisis and scrofula. He was, indeed, a very long way before his time. Tubercle is formed by and deposited from materials abnormally subsisting in the vital fluid. Carswell has even detected it in the blood fibrin of the splenic cells, Quecket and Rainey in the blood of an artery going to a diseased part, Fournet in a blood clot in a tailors aorta, and Andral in blood extravasated in the lungs. We possess few certain indications, observes Louis,* as to the blood alteration in pulmonary tuberculisation, nevertheless everything, he adds, leads us to believe that the matter of tubercle exists primarily in the blood. To be sure it does. The blood of scrofulous persons† has been analysed, but without any satisfactory result. Of course not. A small excess of unoxidised carbonaceous waste in the blood, transformed incessantly into tubercle, unless in the actual form of tubercle, could not I feel assured be determined. In other respects the matter of tubercle may adhere as it were to the surrounding healthy tissue, running into it by insensible gradations, at others it is encysted and distinct, the vessels themselves being isolated or haply obliterated in the tuberculous mass.‡ Occasionally, indeed, the sufferer is car-

* *Dictionnaire de Médecine*, 2 ième, Tome xxiv.
† Simon. *Animal Chemistry.*
‡ Beelard, *Additions á l'Anatomie Générale de Bichat*, p. 324.

ried off by sudden and frightful hemorrhage, some vessel of magnitude becoming wasted through pressure and the consequent absorption, at other times giving way owing to the tuberculisation and thereby accruing fragility of the vascular coats themselves.

PROXIMATE OR CHEMICAL CAUSE OF TUBERCLE.

For the first time in the history of disease, the proximate source of tubercle is, I allege, capable of exact demonstration. The hitherto insoluble problem as to its origin and causation may now in fine be loosed. Tuberculous scrofulous deposits, then, whether in the offspring of scrofulous, consumptive parents, or others, are the invariable results of insufficient imperfect respiratory function and rebreathed air. Hence, the carbon is retained unoxidised, in other words, is not discharged or sufficiently discharged from the blood, and, finding no adequate outlet, being neither burnt off in the lungs nor expended in the tissues, is deposited, mainly as a hydrocarbon, in the lungs and other organs, under the form of the body known by the designation of tubercle. The last link in the chain of causation, the bond of inference, is clear to demonstration. The effete carbonaceous waste, in consequence of a vice of respiration, is not burnt off or sufficiently burnt off. What then becomes of this unconsumed waste. The reply is that it constitutes the foreign body termed tubercle, a body which inevitably forms when respiration, or rather the respiratory nisus, is continued beyond a certain period in a more or less prerespired, effete atmosphere. Owing to the presence of the dead foreign matter termed tubercle, a morbid action is afterwards unavoidably set up, and hectic wasting and death are the inevitable results.

In the first period of tuberculosis of the lungs, as Hutchinson, by the aid of his stethometer and spirometer a sort of gas or air meter, has shown* there is an average deficiency in the vital capacity of the chest, graduated indeed by the height and muscular strength of the individual, which, as the disease advances, is yet farther reduced. These conclusions are illus-

* *Cyclopedia of Practical Anatomy.*

trated by diagrams, founded on some five thousand observations. Even where there is no direct auscultatory evidence of tubercle, although minute tubercular deposits may and do actually subsist, the lessening of inspiratory power will in such cases be more or less demonstrable. It hardly seems to call for demonstration that if the indraught of pure unprebreathed atmospheric oxygen into the lungs be impaired, the formation and excretion of carbonic acid will be diminished in a corresponding ratio.

The chief advantage of spirometric research, when resorted to, is by enabling us to infer or at least to suspect the existence of pulmonary disintegration. The capacity of the chests of individuals, it seems, increases eight cubic inches with every inch of stature. The average amount of air inspired by an adult man is calculated by Professor Valentin* to be about thirty, but I myself made it by actual admeasurement not to exceed twenty cubic inches. When the attention, however, is turned to the act, the amount is apt to be increased somewhat. Edmund Goodwyn,† indeed, estimated it so low as fourteen cubic inches. The absolute capacity of the lungs, however, amounts to some hundred inches cube. It is obvious, as Valentin remarks, that if the air inspired one instant were expired the next, the atmosphere and the blood would have but a short time to act on each other. The equalisation of temperature, the formation of watery vapour, the oxidation of the metamorphic waste, and purification of the blood, result alike from the arrangement that actually subsists. During active muscular effort, in the open air, the measure and frequency of the inspiratory act, with the vital changes thence ensuing, are vastly multiplied and enhanced. Rudolphi observes, justly, that one lung is often smaller than the other, also that the capacity of both lungs is variously affected through prior disease. On examining the remains of aged persons, we rarely find, he says, the lungs quite sound.‡ In other words, the lungs were commonly more or less tuberculous.

* *Grundriss.* Brintons tr. † *Connexion of Life with Respiration.*

‡ Wir finden wenige Leichen alter Menschen in denen die Lungen völlig gesund wären. *Grundriss der Physiologie.*

The whole problem of respiration, healthy and unhealthy, owing to the number of factors concerned, is somewhat intricate. The general conditions of the process, however, are readily appreciable. Exclusive of caloric sufficient to raise the expired air to 99°·5 F. there will be a varying discharge of ammonia, watery vapour, foul animal excretions, and carbonic acid gas, bearing tolerably constant ratios to the oxygen absorbed. The average carbonic acid gas sent out by the lungs, according to Kirkes and Paget, is from four to five per cent of the expired air. If, however, the air which is breathed be already more or less impregnated with carbonic acid, were it but one per cent, nay half a per cent, as is the case when the same air has been more or less prerespired, then, the quantity of carbonic acid further exhaled becomes by so much the less.† Thus, in one of two experiments by Allen and Pepys, in which quite fresh air was taken in at each inspiration, thirtytwo cubic inches of carbonic acid were exhaled in a minute, while in the second experiment, in which the same air was more or less breathed, afresh, the quantity of carbonic acid was not quite ten cubic inches per minute. Valentin reckons the volume of carbonic acid in the air expired during ordinary respiration, at from four to five per cent. But this, by rapid respirations may be diminished to three and even two per cent, and by slow and full respirations may be increased to seven and even eight per cent. Otherwise, the air given out at the commencement of a deep expiration contains less carbonic acid than that at the close. During exercise there is about a third more carbon expired than in a state of rest, nor does this increased discharge cease for some time afterwards. Tea and alcoholic drinks lessen the discharge. Andral and Gavarret found the amount of carbonic acid to increase from eight to forty years of age. Women, in general, excrete less carbonic acid than men do. On the whole, Valentin estimated that some twentyeight ounces of oxygen were taken up, and that thirtytwo ounces or so of carbonic acid, about equal to nine ounces of solid carbon, were given off by the lungs and skin in the twentyfour hours. If, then, any portion of the

† *Handbook of Physiology*, p. 169.

metamorphic carbonaceous waste instead of being given off be indefinitely retained, the eventual result is its deposition as tubercle within the boundaries of the living organism. No inference can be more obvious or legitimate. If the carbon waste be not habitually oxidised and discharged, it can only be got rid of by becoming what we term a tubercular deposit. There is no other possible alternative. The cutaneous carbonaceous transpiration is so small, according to Scharling not more than from a twentieth to a fiftieth part of that given off by the lungs, that, however undesirable its retention may prove, it really counts for next to nothing in respect of the formation of tubercle. The scarlet hue imparted by, and in, the act of respiration to the dark venous blood in the capillaries, is due not so much to the mere oxygen imbibed, as to the conversion thereby of the metamorphic retrograde waste into carbonic acid in, and by, the act of respiration. Oxidise the effete carbonaceous waste and it is got rid of and disappears. Do not oxidise it, and it will remain in the organism under the guise of tubercle, and no other.* The conclusion is simple and inevitable as that of a demonstration in Euclid.

REMOTE OR PREDISPOSING CAUSES OF TUBERCLE.

We do not on close consideration of the medical records of the Greeks Romans and Arabs, find that phthisis occupied that place in their attention which, had it been equally frequent in their time as in ours, it must needs have done. The ordinary habit of the Greeks and Romans, as well as of the Arabs after them, was not only to live a great deal in the open air by day, but also to pass the night in chambers communicating by open doors with an equally open court. Modern usages are very different. The narrow bedroom with its stilted bed, its closed doors and windows, its curtains carpets blinds and hangings, instead of hindering, promotes atmospheric stagnation and impurity, in every possible way, just as if air pure and unalloyed, were not day and night, ever and always, the most absolute and unconditional of all requirements, and one,

* Ex expiratione in fuligine expurgantur. Servetus, *Christianismi Restitutio.*

short of disease and death, impossible to do without. The habits and usages of our daily life, the palliation sought in, if not yielded by our climate, its cold and moisture, forsooth, our infinitely varied forms of industry, combined with the almost incredible ignorance and indifference of the masses, all unite to aggravate the disastrous results flowing from the habit of respiring an impure prebreathed atmosphere, an atmosphere loaded with animal excretions, and therefore unfitted utterly for wholesome human use and requirements.

Ever since my attention was turned to this important subject, I have with an increasing fulness of conviction, discerned the evil results flowing from the respiration of an ill renewed prerespired atmosphere, rendering the oxidation of the metamorphic waste and the sufficient purification of the blood next to impossible things. What hosts of promising young men and women, of children under age, of aged persons, have I not seen consigned to destruction through the agency of causes whose every stage I could trace, though too often I was unable to exercise any adequate countervailing influence and control. The physician is consulted too often when disease becomes deep seated or when the individual is placed in circumstances whose malignant influence he cannot sufficiently set aside. The close student who shuns air and exercise in his eagerness for the lore which unhappily is never to avail him, the professional man, the merchant, the tradesman, the artist, the artisan, the factory hand, the young workwoman, the labourer, and the house mother, pass in long array before the medical man, each labouring under the varied aspects of that disastrous malady which is to put a stop to their career for ever. When the factory lad or the young girl, who has had the range of a parents house wherein to come and go, to work or pause, is confined all day long in an ill ventilated apartment with a number of others, presents himself or herself, before the physician, with hemoptysis, dulness beneath the clavicle and progressive emaciation, while brothers and sisters differently circumstanced remain free from disease, what is it but an *experimentum crucis* as to the potent the inevitable efficacy of seclusion and inaction midst an irrespirable or not healthily

respirable atmosphere in the production of phthisis. The history of these cases is ever the same, a mournful and wearying iteration of the phenomena of disease. Let the cause only come into operation, and the result is certain. How often have I seen father and son pursuing the same sedentary ill-conditioned calling, taken off in succession, while the profligate member who would not subject himself to unhealthy industry, has escaped. The poor are decimated, more than decimated, by consumption, while delicate wives and mothers, perhaps after numerous confinements, shut themselves within doors apparently without ever dreaming of the absolute necessity of a more or less out door existence, and the needfulness of a life in strict relation to the natural requirements of the living organism and of our climate with all its damps and chills and vicissitudes.

It is now a couple of centuries since Zacutus Lusitanus* and more recently Kortum,† recognised the ill results of a pent up atmosphere, in respect of the spread of disease, and on this account commended the evening and morning throwing open of windows. Baudelocque, however, yet more effectually turned attention to the production of scrofula from the more or less continued respiration of foul air. His works, and those of Fourcault, should be in the hands of every physician, every philosophical thinker, I had almost said every parent. These writers, to be sure, often err in their general reasonings, as well as in regard of the treatment which they recommend, but they are quite in unison as to the infinite malignity of a deteriorated ill renewed atmosphere, esteeming its respiration the infraction of a hygienic law, indeed the violation of an eternal truth. Experience and meditation, says Baudelocque, have afforded me the deep conviction that scrofula has a cause which takes precedence of every other cause, a cause without which the disease rarely or never develops itself. This cause resides, and resides alone, in certain atmospheric peculiarities. However indifferent or insubstantial be the nourishment, whatever

* Qua de causa fenestrae cubiculi mane et vesperi debent aperiri.

† Maxime nocet somnus nimius si in lecto sordido, madido, vel in cubiculo quod vitiatus aer replet.

may prove the absence of cleanliness, the sufficiency or insufficiency of clothing, the climate, amount of exercise, of sleeping, or of waking, if the abode be one in which the atmosphere is readily renewed, if the suns rays play directly upon it, if the house be airy, well lighted, and duly proportioned to the number of occupants, scrofula will never visit it. On the contrary, however excellent may be the nourishment, exquisite the cleanliness, whatever may prove the goodness of the clothing, sufficing the amount of sleep waking and exercise, if the locality be badly sunned, the air imperfectly renewed, and the dwelling narrow low dull and badly aired, there, shall scrofula inevitably develop itself.* Scrofula, says Baudelocque, never attacks any one who passes his life in the open air, whereas, wherever there is scrofula, there, also, if we examine, shall we detect foul air.† He refers the frequency of scrofula, in other words of tubercle, in villages and country districts, to the wretched construction of dwellings rendering the atmosphere unhealthy and irrespirable. If, indeed, eight hours out of the twentyfour be spent in sleeping apartments where the atmosphere is such as to render a healthy hematosis impossible, it must needs induce disease. Children who pass the nights with persons older than themselves, are rarely healthy. Irrespective of the deteriorated atmosphere, the childs head is covered up when the individual with whom he sleeps draws the clothes about the shoulders, the more so as the high pillow which suits an adult causes the infants head to slip off. The habit of covering the heads of children during sleep, is one fraught with ruin and decay. What does it signify how pure the atmosphere is without, if only, it be impure and irrespirable within. It is in fact, as things now are, very much more the indoor life, the indoor climate and environment, than the outdoor, which govern the production of health and disease.

Sedentary occupation renders the hematosis of the blood defective, and the discharge of its impurities less perfect. Tuberculous maladies rage among needlewomen tailors printers clerks students and others, whereas butchers carters

* *Revue Médicale*, Clinique de l' Hôpital des Enfans, Mem., 1832, Tome I., p. 10.
† On découvrira l' alteration de l'air. *Etudes*, p. 164.

smiths carpenters joiners and drovers, are comparatively exempt. Schools convents and penitentiaries, in default of air exercise and insolation, are the habitual seats of disease. In the mendicity depots of Amsterdam and other continental localities, the phthisical mortality is very great. Here, the ever tainted atmosphere renders the proper hematosis of the blood impossible. The cellar population of Lille, and other places as well, are carried off by phthisis and scrofula. In a memoir read before the French Institute, Fourcault particularly adverts to the case of the Hôpital Général of Lille, containing twelve hundred inmates. The boys when sent to active employments escaped, whereas the girls, ah ponder it closely and well, condemned to sedentary pursuits, contracted rickets chlorosis mesenteric disease scrofula and caries of the spine, so that their abode in the asylum was simply and truly a sentence of death. Of Marseilles Lyons Nîsmes Bourdeaux, Fourcault relates facts equally disastrous and deplorable. He adverts to the great frequency of consumption among the military of Belgium Holland and France. He might have added that of our own Dragoon Guards, among whom the mortality from phthisis is, or was, actually twice that of the population at large. Soldiercraft is a species of incarceration, a sort of military monachism, in which men owing to rebreathed air, perish like the flies which suck up the poison that is laid for their destruction. It is the same in asylums, prisons, drear relics of the stolidity and barbarism of bygone times. The annual mortality from phthisis in Pentonville prison up to the close of 1844, was very great, but in 1845 proper measures of ventilation having been introduced, the disease almost entirely ceased. Yes, confinement it is which, in man and brute, gives rise to tubercle, while life in the free the open air yields immunity from tubercle and tubercle induced decay.

If, says Fourcault, we transport ourselves to the penitentiary of Roquette, we shall at once be struck with the pallid unhealthy aspect of the children, their dry scaly and torpid skins. Pure air by day, well observes Baudelocque,* is not

* *Etudes*, p. 165.

enough, it must also be respired at night. Many shepherds, he remarks, though exposed by day to every atmospheric vicissitude became scrofulous, inasmuch as by night they slept in a sort of covered closed up cart or caravan in which renewed air was an impossible thing. Among the New Zealanders,* scrofula, kings evil, consumption, suppurating neck glands, psoas and lumbar abscess, are painfully prevalent, owing to the low airless hovels in which with closed door and windows, in imitation of civilisation, men women and children, all night through, respire an atmosphere as unwholesome as in the worst ventilated houses in the poorest parts of London.† In truth, the great experiments of life and death are in ceaseless course of performance throughout every family, every community, every people and clime. Tuberculisation in the forms of phthisis and scrofula, with premature unnatural decay, follows in the train of confinement inaction and, in fine, the respiration of an effete prerespired atmosphere, as the iron follows the loadstone or the tidal wave the sun and moon. Air, as Hippocrates truly says, is a species of nutriment, but foul prebreathed air is the worst of nutriment, serves but to awaken disease. Wherever an impure already breathed air subsists, there, also, subsists consumption, there also prevail scrofula and untimely death. Why seek for many causes, then, when nature contents herself with one.

Whenever and wherever a pure sweet well renewed atmosphere is breathed by day and respired by night, tubercles will not be deposited and phthisis will not ensue. A vitiated prerespired atmosphere it is which is the condition *sine qua non* of the malady. Wherever there is foul, that is to say prerespired air, there, soon or late, we shall witness scrofula or consumption, and wherever there is no prerespired, no prebreathed air, there, consumption and scrofula will be impossible and unknown. Tubercle subsists not where the air is unprebreathed and pure, whereas it is impossible that the respiratory processes can be healthy where a pent up already breathed atmosphere is the habitual unwholesome pabulum of life.

* Dieffenbach, *Travels in New Zealand.* Mundy, *Our Antipodes*, p. 229. Bishop Selwyn, *Visitation Tour in* 1848.

† Thomson, *British and Foreign Medico Chirurg. Review*, April 1855, p. 521.

Warm climates exhibit no immunity merely as such. Tubercle, indeed, is frequent enough among the specimens in the pathological museum at Calcutta. If a sweet unprerespired atmosphere be habitually respired in warm climates people will there contract no phthisis, but if this lung food, so to term it, be foul and prerespired, consumption is inevitable. Children and servants are put to sleep anywhere and anyhow, so there be only room for a bed, hence, even in opulent families, we witness outbreaks of consumption and scrofula which are referred to every and any cause but the right one. The structure and requirements of the human frame are always the same, and violations of the conditions of health must lead to like results. In warm climates as in cold, people fall by default under the self imposed curse of dying.* There must, in truth, as has been well said, be something debased in the condition of a people who have sacrificed the power of attaining to old age. In the East and West Indies, Egypt, the south of Europe, the Levant, wherever, in fine, people spend a portion of the year in close narrow chambers, there, phthisis, the warm and genial atmosphere, notwithstanding, is sure to assert its devastating power. The natives of India† form no exception. Tubercle exists to the extent of not less than twentyfive per cent in those who perish in Indian jails. Egypt, indeed, as Clôt Bey informs us, is not exempt.

Pathologists only conditionally concede the morbid influence of foul air, and yet they do admit it. But none of them were aware, until assured by me, that it is not fouled air, in the general, that induces or can induce tubercle, but only air fouled by prerespiration. Scrofula, affirms Sir James Clark, may be induced even while the patient breathes a very pure air.‡ What an idea. The occurrence is simply impossible, opposed alike to observation and to facts. If the air of ill ventilated alleys be indeed capable, as he thinks it is, of inducing scrofula *de novo*, of what must the air be capable that subsists in the dwellings which are situated in such alleys. It cannot be that a foul, prerespired atmosphere should be productive of in-

* Chevers, *On the Removable and Mitigable Causes of Death*, Calcutta, 1852.
† Wilson, *Indian Annals*.
‡ *Treatise on Consumption*, p. 232.

ternal and external tubercle at one time, and not be productive of it at another. Other influences may cooperate, but this is the one sufficing cause, and the etiology being once established, it is superfluous as it is unphilosophical to seek for any other. How striking is the instance which is cited by Bordeu. It is that of a princess at Barèges who took a fancy to a little shepherd boy. He had slept upon the naked turf which he shared with his sheep.* A crust and a cup of sour milk were his food. He enjoyed glorious health, withal, until he was taken in hands, in fine, lodged fed and educated, to such purpose, that within a year the mesenteric glands became tubercle gorged, scrofula broke out, and he perished miserably. It is noteworthy that students, persons designed for the learned professions, incur the extremest risk of tubercle, are often indeed the only weak and scrofulous persons in their respective families.†

The dry grinders who reside in the confined and deteriorated atmosphere of their Sheffield homes, die ere they attain to thirty, whereas those who work in the country reach the age of forty years.‡ If they only occupied airy chambers by night, poor creatures, they would live yet longer. Ere the introduction of steam power,§ all dry grinding was on rivers, so that the grinder had abundant air and daily recreation, besides holidays owing to occasional want of water. But absent ventilation and sedentary pursuits are the ever recurring sources of phthisis. For they subject human beings to the poison of prebreathed air. The laws of reason forbid us to seek or to assume more than one cause when that one suffices.‖ That cause is rebreathed air. It is the only one. There is no satisfactory reason, says Ancell, why the children of the richer classes should become tuberculous. But, indeed, there is. The ill effects, when subjected to them, of close rooms and curtained beds affect the rich quite as much as they affect the poor.

* Le gazon qu'il partageait avec ses brebis. *Memoire.*
† Les seuls ecrouelleux de la famille. Baudelocque.
‡ Thackrah, *On the Diseases of Artisans*, 2d. Ed.
§ Holland, *On the Diseases of the Lungs from Mechanical Causes.*
‖ Leges philosophandi, vetant plures causas fingere vel quaerere quam quae ad rem explicandum sufficient. Gregory, *Conspectus.*

The poison of a prerespired atmosphere exempts no one. Farr enlarges on the appalling fact of thirty thousand women having died in one year in England of consumption alone. Consumption and scrofula are terribly prevalent in Scotland. Young, who himself perished of phthisis, sets down one fourth of the mortality throughout Europe to this one single cause.* While Lugol goes so far as to assert, and asserts truly, that a fifth of the human race labours under tuberculosis.†

The influence of atmospheric air on the constitution of the blood, in relation to tuberculosis, has been overlooked where one would not anticipate the omission. Yet, where is the physical agent whose influence in any possible respect comes up to it. Medical science, however, is not built up in a day.‡

Laennec speaks of a conventual institution in Paris, in which, during the ten years in which he was physician to the establishment, all the inmates, the superior gardener cook nurse and gatekeeper, excepted, were twice or thrice removed by death. At the end of a couple of months, speaking of the young female inmates, the menstrual discharge would cease, then, after a time phthisis would ensue, and, unless when he was able to persuade the poor ailing creatures to leave the scene of their immolation, death.§ Most of those who went away, although the symptoms of phthisis were strongly manifested, recovered.‖ Carmichaels evidence is very striking.¶ He mentions a parochial school of twentyfour girls well fed and clothed, of whom seven became scrofulous although not a single one had the disease upon admission. No yard or court of any kind was attached, and the children had to remain in their one school or bedroom during play hours. In a school of six hundred boys at Norwood, scrofula was prevalent until Arnott rectified the ventilation, whereupon the malady ceased. In Cornwall Mackworth mentions,(1) that while thirty out of the hundred of the general population die of chest disease, sixty per cent of

* *Practical and Historical Treatise on Consumptive Diseases.*

† *Mémoires sur l'Emploi de l'Iode.*

‡ Baglivi, Medicina non est ingenii humani partus, sed temporis filia.

§ *Auscultation Médiate.*

‖ Quoique plusieurs d'entre elles présentassent déjà des symptômes de la phthisie d'une maniere trés manifeste.

¶ Essay on Scrofula.

(1) *Diseases of Miners.*

the miners thus perish. Dr. Angus Smiths report* confirms this frightful and abominable anomaly. In two thirds of the mines the air was very bad. While there was but 18·69 per cent of oxygen, there was actually from 1·8 to 2·26 per cent of carbonic acid gas. Thus, then, are these poor fellows destroyed through the insufferable ignorance and gross neglect of their employers. Colonel Sykes has described a disease termed *mithooa*, very fatal in Upper Hindoostan.† It is no other than mesenteric tubercle as developed in children cooped up in the vile recesses of ill aired houses. Rebreathed air everywhere is always the cause, tubercle consumption and scrofula everywhere and always the effect. They are as shadow and substance, one follows and attends the other inevitably as fate.

Want of exercise along with a stagnant prerespired atmosphere, tends as thus to tuberculous disease. A passive life, merely, were it only in the open air, would not induce tubercle. But inaction and indoor life, at least in these climes, are virtually synonymous. Those who remain habitually within doors, not only lose the direct benefit of active vigorous outdoor effort, but they respire a stagnant prebreathed atmosphere, unfitted utterly for a healthy hematosis.‡ An active varied existence in the open air is life to the young, whereas inaction and confinement, coupled with prebreathed air, are death.§ Carmichael dwells on the evils of deficient effort, the motion of the diaphragm only sufficing to prevent complete stagnation. Pressmen are about a fourth less liable to tubercle than the more stationary compositors. Anything, indeed, that lessens the utter stagnation attendant on indoor life and action, conduces to the better hematosis of the blood, averts more or less the evil efficacy of a decayed and decaying atmosphere.

Insufficient exercise, indoor sedentary occupations, ill ventilated habitations, and prerespired air, not cold,‖ not damp,

* *Medical Times and Gazette*, 4 February, 1865.

† *Statistical Journal*, March, 1847.

‡ Impedita respiratio, qualiscunque ejus causa fuerit, motum sanguinis plus minusve impedit, et simul expulsioni materiae noxiae e pulmone, et mutationi isti salutari et necessariae sanguinis. Gregory, *Conspectus*. Section D., c. 2.

§ Le repos est toujours meurtrier aux enfans. Baumes, *Traité sur le Vice Scrophuleux et sur le Maladies qui en proviennent.*

‖ Drake, *On the Diseases of the Interior Valley of North America.*

as was long believed, induce the tubercular diathesis. Not even climate, but all the environment of life, is the same for the rich man as for the poor, observes Cabanis.* The whole entourage of existence in truth is different. Cheerless dirty airless abodes, repulsive uncleanly habits, and unhealthy pursuits, all fall upon the poor with double virulence, so that the mortality among the working classes is, in fact, double what it is among the rich. The dwellings of the rich, indeed, are badly enough ventilated, but the deficiency in this respect is dreadful among the poor. Every propriety, almost every sanitory observance, is habitually and necessarily violated. Bent all day long over some sedentary and therefore unwholesome pursuit, the poor man repairs at night to a chamber, low dirty unventilated, and, there, in the narrow sweltering precincts, amid the festering exhalations of a whole family, perhaps whole families of souls, consummates the organic ruin which has beset him throughout the day. The idea, as yet, seems but to dawn on the civilised mind that bedrooms, sittingrooms, and workrooms, need a constant interchange, in respect of air, with the exterior atmosphere, not only by day, but by night also. However it may be with the few, the masses are uninformed utterly. But to cleanse the Augean stable were a very trifle compared with the difficulties which the man must encounter who would unmask a single prejudice, supersede a single habit, however hurtful and pernicious to his kind.

ON THE TREATMENT OF CONSUMPTION.

The essays of Laennec, the treatises of Louis and others, are perfect treasuries as to the general symptoms and history of phthisis. But the subversive and contradictory opinions which the authors of these treatises maintained and which are still entertained as to the real origin of phthisis, render these treatises, as respects curative and preventive measures, of little or no avail. Unless we ascertain the cause of the malady our labour is lost.† As a great inquirer, has said,

* *Sur l'Homme.*

† Nisi consulueris antecedenti causae quae fovet morbum, operam perdis. Riolanus, *De Strumis.*

what signifies what we know, if we do not know how to cure the disease.* Unconnected facts are of no avail. How, in truth, are we to induce practitioners to attempt the removal of a malady, the origin of which they refer to an ancestor. Had the labour and research, observes Clark, wasted in fruitless experiments to cure an irremediable condition of the lungs been directed to the discovery of the causes and nature of tuberculous disease, consumption would be regarded in a very different light. Now, this is precisely what the author of this book has attempted, and, as he believes, what he has accomplished. Ten years, ten long years, have elapsed since the first edition of this book, and, yet, the same idle theories, the same preposterous medication, subsist as then. Consumption unhappily, is in no respect diminished in frequency. And, yet, by a wise concert, a concert based on the views here set forth, this thrice disastrous malady might be banished from the world. Were rational views, I say, but once adopted, consumption, this dread malady, would become as accessible to human control as smallpox itself has become. The wretched and accursed malady which is the subject of these pages would, I assert, become not only potentially removable, but very certainly preventible.

In considering the curability of phthisis, in those cases in which it has unhappily been suffered to ensue, we must take into consideration the reciprocal influence of our organisation and of the outer atmosphere. We act upon the atmosphere, and the atmosphere in turn acts upon us. In order to a possible sound and wholesome result, the reciprocity should on both sides be a sound and wholesome reciprocity. If we poison the atmosphere with the products of respiration, the atmosphere so empoisoned poisons us in turn. If, instead of narrowing our requirements to a few cube feet of air which at each inhalation becomes yet more unfitted to support life than before, we draw upon the atmosphere, at large, health and vitality, at least so far as they accrue from breathing a pure atmosphere, will prove the unvarying results. It is the atmosphere† which animates

* Nur die Anwendung, nicht der Besitz, macht den werth des Reichthums. Treviranus, *Biologie.*

† Belebt. Reil, *Pathologie*, Band I., Halle, 1855, S. 139.

the blood, and which, in turn, animates all the organs. It is the air which sustains life, all other gases fail.* If the blood, says Barlow,† be inadequately acted on by the air, its composition will be impaired, and it will no longer afford the usual stimulus and support to the organs. When respiration is performed in a limited air supply, the breathing becomes oppressed. All warm blooded animals, remarks Edwards, when confined in the same air alter it nearly in the same degree, and though it still contain some oxygen, it proves as fatal to them when placed in it as does immersion in water.‡ If the air which is habitually breathed be impregnated with carbonic acid and animal foulnesses, as is the case when the same air has been previously respired, it is necessarily more or less destructive of life.

If facts, then, such as these do not render plain to all men the intimate necessity of a constant supply of fresh unprerespired air in the treatment of consumption, how, I should wish to ask, is conviction to be enforced. The never ceasing action of inspiration promotes the circulation, how infinitely important, then, it is that the blood thus circulated should prove pure. From Herings experiments on horses, it was indeed found that a solution of the ferrocyanide of potassium mixed with the blood, took but thirty seconds to pass from one jugular vein to the other. If the whole mass of the blood thus pervade the frame of man or brute in less than a minutes duration, how transcendently important to every portion of the organisation must the condition of the blood, in respect of health and disease, ever prove.

Many might recover from phthisis but do not, simply because the blood is not adequately purified, and the evil influences which have been productive of the malady also subsist during its continuance. Every method of treatment must prove subversive, that attempts the removal of phthisis without also essaying to remove the exciting cause. Yet how, in heavens name are we to remove phthisis when the lung or lungs have undergone disorganisation. Bayle, indeed, considered the

* Alle andere Gasarten sind dazu unfähig. Rudolphi, *Physiologie*, Band II., p. 165. † *Cyclopedia of Practical Medicine*. Art. Physical Education.
‡ Edwards, *Influence of Physical Agents on Life*, p. 93.

treatment of phthisis, in a curative point of view, as quite illusory. No doubt. For how could any treatment of phthisis avail that bore no reference to unprebreathed air. Nevertheless, says Laennec, on examining persons who had perished of various maladies, but who previously presented symptoms of consumption, there were discovered anfractuous cavities lined with a semicartilaginous membrane. These cavities, Laennec looked upon as the result of an effort of nature. He cites a case by Bayle of a lady who had laboured under phthisis for fourteen years. She had had pectoriloquy in the summit of the right lung, nevertheless, contrary to all expectation, she recovered. With any approach to rational treatment the aggregate of recoveries would vastly increase. Many, indeed, get better, then relapse, improve again, and afterwards incur a fresh and final attack ere they are carried off. This continuous effort of nature it was that induced Bayle to say that phthisis might last forty years.* I have known it myself to last many years, the patient dying of intercurrent bronchitis or pneumonia at last. Each successive lung tubercle may be looked upon in a sense as so many successive attacks of consumption. Hence, in all attempts at the rational cure of phthisis, we must not suffer further deposits of tuberculous matter. For, unless this be done, all our efforts are in vain.

Phthisis, says Louis,† terminates with almost invariable fatality after a period varying from a few weeks to some years. Yet, for all this, he relates instances in which cavities, as demonstrated by examinations after death, had healed up, in other words were lined with false membranes. What is this, what are these, but instances of recovery. And what else are those other instances of calcareous or cretaceous concretions so often found at the lung apex, than instances of tubercles cured or transformed. Now, half the women whose remains were examined at the Salpetrière, actually presented one or more of these concretions at the summit of the lungs. Louis, in truth, virtually concedes the inferences flowing from the researches

* Bayle, *Recherches sur la Phthisie Pulmonaire.* Rogée, *Essai sur la Curabilité de la Phthisie Pulmonaire.*

† *Recherches*, Chap. 4.

of Rogée Laennec Cruveilhier and Andral.* Andral, himself, sums up the matter by observing that tuberculous cavities, sometimes diminish and become occasionally obliterated, adding, however, that this occurrence unhappily seldom benefits the patient owing to the simultaneous existence of other tubercles.† The cicatrisation of tuberculous cavities, and calcification of tubercles, then, have been demonstrated both in the living and the dead. Without a doubt nature endeavours to remedy every case of tuberculous deposit, and would much oftener succeed, too, did we only second her endeavours by suitably adjusted treatment, and, especially, by the unlimited supply of unprebreathed air without which all treatment is utter waste of time and means. Remove the cause and we remove the effect.‡ But how can a disease be removed if we be ignorant of its cause. Thus, when Laennec adverts to the efficacy of a sea shore residence, he does so without any real appreciation of the advantages, conditionally, and, indeed, incontestably derivable from it, when guided by sound principles and treatment founded on them.§

How slow, alas, is the progress of improvement and discovery. A Laennec applies a roll of paper or a wooden cylinder to the naked chest, and finds that it somewhat assists and directs his hearing in the localisation of morbid sounds. He further detects the healing of tuberculous cavities both in the living subject and after death, then contracts phthisis himself and perishes, without having ever attained to almost a single rational idea as to the causes and treatment of the disease. In respect of physical diagnosis, after observers have done little except to repeat, and, very partially, to modify his conclusions. This remarkable man mainly contented himself

* On sera forcé d'admettre que ces cicatrices à cavité vide ou renfermant une matière cretacée, sont une heureuse terminaison des excavations tuberculeuses. *Dictionnaire de Médecine*, 2d Ed. Tome xxiv., p. 330.

† L'existence simultanée d'un grand nombre d'autres tubercules. *Clinique Médicale*, 2 ième p. 390.

‡ Sublata causa tollitur effectus.

§ Les heureux résultats obtenus en 1858 dans le traitement des enfants scrofuleux et rachitiques, par un séjour de quelques mois aux bains de mer, m'avaient inspiré la pensée d'établir, sur le bord même de la mer, un Hôpital destiné à recevoir 100 enfants, pris dans nos deux Hôpitaux de la rue de Sèvres et de Sainte-Eugénie. A. Husson, *Compte Moral de l'Administration de l'Assistance Publique*, Paris 1861, p. 51.

with observing. The precept was afforded him by his master, the father of medicine, and is the motto of his work.* Doubtless a great part of medicine is to observe, yet, what is observation without introspection, the power of drawing conclusions, its most needful ally and complement. About fourteen or fifteen years after Laennec had produced his great work † another observer, Baudelocque, came forward.‡ Laennec determined the seat natural history and occasional cure of tuberculisation. Baudelocque referred the production of scrofula to the respiration of foul air generally. While in this treatise and elsewhere I assume to show that tubercle itself is no other than the unburnt carbonaceous and hydrogenous waste, not discharged by the proper respiratory outlets and consequently accumulating in the blood. I thus complete the last links of the chain of morbid causation, and for the first time place the hitherto incomplete and unresolved problem of the true nature treatment and prevention of tubercular consumption on the unassailable basis of sound observation and pathological inference.§

Tubercles may not only be directly expelled and the resultant cavities heal, but the tuberculous matter, itself, is also susceptible of complete absorption, with the exception of certain earthy ingredients, when present, and which may, themselves, be eliminated subsequently. Every absorption of tuberculous matter, then, as I have said, must be looked on as an attempt at recovery, each renewed deposit of tuberculous matter as a fresh attack. And how frequent might be the fortunate issues from these critical balancings of nature between life and death, did only a rational treatment happily second her intentions.

The treatment of phthisis may be divided into palliative and curative. In practice, indeed, these modes as far as possible are to be combined. When the lung or lungs, however, are in a state of utter disorganisation and decay, when the blood is

* Μέγα δὲ μέρος τῆς τέχνης τὸ δυνασθαι σκοπεῖν.

† *De l'Auscultation Médiate.*

‡ *Etudes sur les Causes, la Nature, et le Traitement de la Maladie Scrophuleuse.*

§ Contre une maladie fréquente et mortelle comme la phthisie pulmonaire, ce n'est plus tant à la guérir qu'à la prévenir que l'on doit s'appliquer. Plus de deux mille siècles d'expérience, de tentatives infructueuses dans la première voie ne montrent que trop combien il est inutile, superflu de s'y arrêter exclusivement, mieux vaut s'engager résolûment dans la seconde. *L'Union Médicale*, Paris 22 Octobre 1862, p. 153.

completely poisoned by the habitual retention of the excretions, and when the whole system is as it were given up to the enemy, we cannot hope to do much. For, as Portal* remarks, how are we to restore an organ that is disorganised. It is in fact death with which we have to deal, and who shall cope with death. But short of this, much may often be done. We may alleviate suffering, prolong life, and sometimes even effect a cure. Phthisical sufferers, their malady being overcome, often live to an advanced age. And why not. A very aged physician, who had nearly completed his hundredth year, assured me that in his youth he had laboured under hemoptysis and every other phthisical sign. In cases apparently desperate, there is sometimes ground for hope. Even pneumothorax, as consequent on tuberculous perforation, is not always of necessity fatal.† The judicious physician is indeed aided by a sleepless and most potent auxiliary, in subordination to which it is his ceaseless duty to act. The more he does so, the oftener may he hope to effect a cure.

The practitioner, however, while he invokes the aid of nature, must not lay aside the succours of art. And, here, I must again declare that without the respiration day and night, and always, of a perfectly pure and unprerespired atmosphere, exactly as nature furnishes it, we need hope for no success. This, indeed, must be the unvarying correlative of any and every mode of treatment. Combined with this, any treatment not directly or indirectly hurtful may succeed, without it no possible treatment can otherwise than fail. A fresh untainted unprebreathed atmosphere, at all hours times and places, is the one condition of treatment which nothing must interfere with or set aside. Arrangements, therefore, must be made in which, by means of flannels silks furs chamois vests, by day, bedclothes warm and fleecy, by night, aided if needs be by coverlets of cotton goose or eider down and open fires, bodily warmth is effectively sustained, while at the same time there shall be a ceaseless, unlimited supply day and night, winter and summer and always, of an unpolluted unprebreathed at-

* *Observations sur la Nature et le Traitement de la Phthisie.* Paris 1809.
† Banks, *Dublin Medical Quarterly*, May, 1854.

mosphere in the apartment of the sufferer. The simple rule is to let the chamber atmosphere prove pure and untainted as is the open air, itself, in which, indeed, the patient should otherwise spend as much time, in fact pause as much, as his strength, the weather, the season, and his means will permit. He must, in short, live in the open atmosphere, but then it must be the open atmosphere and its wholesome influences, coupled with, not thwarted by, house comforts and home shelter.

For this uninterrupted atmospheric purity it is which is the one needful thing, the *alpha* and the *omega*, without which all treatment is a thousand times worse than nugatory. And what, it may be asked, is the criterion. Why, reason and observation must be the criterion, the unperverted senses must be the criterion. In their delicacy of apprehension nature in the senses has furnished us with a sure and certain test, a test which, when one has not spent ones days in some fuzzy frousy fusty tainted atmosphere, they do not, cannot err. Measures plain and obvious must in truth be adopted. The windows, whether French or English, qualified indeed by the degree and direction of the wind, should be thrown largely and freely open by night, particularly, both in summer and winter. Nor drifting wind, nor damp nor rain nor snow, although of course to be guarded against, are to be dreaded as is confined air. With due precaution they cannot hurt, but confined, prebreathed, air will surely kill. When the patient, however, is dressing or undressing, when he is taking a bath, or during any other needful proper occasion, the window for the time being may be closed. The arrangement, it will be understood, must be simply such, that however small or large the apartment may prove, the patient shall not, so far as it can possibly be prevented, respire a second time, any part of it, the same atmosphere, much more respire it again and again. It is quite a mistake to suppose that a large apartment, as such, will suffice without open windows. It merely holds more foul air. For, even supposing the air to be pure, it will not necessarily come of itself from the different and more remote parts of the chamber to be breathed.

I cannot without a sort of sickening horror, recal to mind the apartments which it has been my duty to visit in the course of my attendance on the consumptive. How can one, indeed, recount the impurities and the foulness flowing at once from the necessities of the poor sufferer and of those about him, the must the dust the fust and the closeness, indescribable. The chamber atmosphere, as Baudelocque says,* has been overlooked. Yet, there, I assert, in the narrow, hermetically sealed space, isolated for numerous hours, perhaps amidst curtains, in the perishing and unrenewed atmosphere, we shall find the source of the ill. There, indeed, resides the fatal influence, there, the dragon which destroys our kind. Even when the more gross deficiencies are perchance corrected, there is often a chamber atmosphere devoid of all freshness and vitality, in brief an atmosphere inelastic unrenewed prebreathed impure. I have this moment within my minds eye sleeping chambers, airless closets, holes, which have produced and must needs continue to produce tubercle, in all who have occupied or should ever occupy them. Suffice to say it, then, the air, day and night, must be pure unprebreathed incorrupt, else there cannot be a prospect of recovery, or even of partial relief short of being drenched and stupified with narcotics, drugged with prussic acid, or as I have seen, rendered insensible by chloroform. It is impossible that the blood can be purified, it is impossible that its waste carbon can be oxidised, it is impossible I say that it can be regenerated by the vivifying oxygen, it is impossible, in fine, that tubercle when existent can be dissipated, rendered effete, or that the patient can recover, if the atmosphere which he habitually respires be not suffered to be pure as God hath made and given it to us, and convinced as I am of my life and being, that He has intended us all, sick and well, to make use of it. There can be no sound respiration in an unsound prebreathed atmosphere. These, then, are words which I would inscribe on every stethoscope, in every sick room, or were it possible over every chamber door. The constant uneasy dread of taking cold, which so haunts the minds of patients

* *Etudes*, p. 131.

and their friends, is doubtless the one great reason why fresh air is so thrust aside. And, yet, cold will not be caught were it in Nova Zembla itself, by night, if only the sleepers body be adequately covered, the clothes well tucked in under the chin, and the coverlet corner thrown over the exposed ear. All are sensible enough of the evil of taking cold, but all are not sensible of the infinitely greater evil of respiring an unrenewed, contaminated, and above all a prerespired atmosphere. The body, however, is able to sustain a certain range of temperature, and cold is only taken when the natural warmth is inadequately sustained. Let that be sustained by all means, but let us not the less respire pure air. The inferior animals are provided with sufficient means and appliances by nature, but, then, man has reason wherewithal to secure artificial warmth, whether by night or by day. Clothing, in truth, should be better adapted than it is to the varying requirements of season and clime. Our chambers ought to be more equably heated, and better aired than they are. Thus, should we be able to court the utmost desirable open air exposure, at all times, as well as to admit the exterior atmosphere, itself, freely and efficiently into our abodes.

It was once a general prepossession that taking cold, that damp night air, forsooth, was a source, the source indeed of consumption, but this is a great error. The coldest dampest air does not, never did since the world began, and never will, induce consumption. It is only the respiration of dirty unrenewed prebreathed air that does or can induce consumption, at any time. If only the air be pure, unprebreathed, it will not, however damp, however cold, however dry, however low the situation, however high, induce consumption. But if the air be impure, prebreathed, however warm and balmy otherwise, there, consumption will surely rage. If the air be sufficiently renewed indoors, while the body is sufficiently protected out of doors, there will be no consumption, were it even in the instance of the sickliest most delicate persons. Otherwise, it is not cold air or its admission into our chambers, but the insufficient protection of our persons that occasions taking cold. Contrary to the general prepossession, I affirm, that the air is as

good, nay better by night than by day. Night air, as such, never injured any one, it is only impure or chill air, and then only when the body is not protected, that does so. How, indeed, is it possible to have any air at night except night air. Impure prebreathed night air kills, just as impure prebreathed day air kills. Not so pure unprebreathed night air, which should be freely admitted into every room, until the air within shall be pure and fresh as beneath the free heavens themselves. As for myself, I have slept long years with my chamber window open. For years my family, and every one whom I have been able to influence, protected, indeed, by sufficient night coverings, have done so likewise, not only with impunity, but with every conceivable imaginable advantage. If only the open air by night were hurtful, as people insanely imagine, the birds of the air and the beasts of the field must have perished long ago. If the night air were pernicious, the myriads of our species who, in arctic and antarctic regions for months of every year never see the sun, and who for that period can have no day air, at all, must also have perished. If indeed pure air were a thing of price, of factitious price I mean, for otherwise it is priceless, if people had to dive for it into the seas depths or grovel for it in the mine, they would duly value and appreciate it. Yet, as Gods free and most inestimable gift, why should they not value and appreciate it as it is. I insist upon this matter in this place, thus forcibly, in order, so far as in my power it lies, to oppose the mad idea of conducting the treatment of phthisis under conditions which are absolutely productive of the malady. For how is it possible to treat phthisis with even a shimmer of success, if we attempt to deal with it in that prebreathed atmospheric environment which, as I have shown, alone induces the disease.

The phthisical sufferer, then, should spend as much time in the open air, in all seasons, as his strength and the weather will permit. A warm covering in cold weather is a silk or light cloth pelisse or overcoat, wadded with cotton or down, and lined with silk. It should be made very loose, need not weigh more than a few ounces, and keeps out very effectively both damp and cold. Many sufferers are in fact unable to

walk at all, without incurring a most undesirable degree of exhaustion, in consequence of the absurdly weighty coverings with which they are so loaded. If at all able, locomotion on foot is most desirable, alternated, indeed, as Sydenham and Desault and Rush have recommended, by exercise on horseback, or even on that humble but often excellent substitute, a donkey. If the weather suit and water be at hand, I would most strongly urge rowing. Even the swing, with a safe and comfortable seat, is not to be despised. Laennec, himself, admits that we have no better means of opposing phthisis than sailing about and living by the sea shore in the mild season. No one, now a days, however, will place any serious confidence in that other remedy, fresh wrack, *fucus verrucosus*, the introduction of which, ignorant of what ought to be done, into the chambers of the sick, was also much commended by Laennec. The peculiar atmosphere of the sea, the ozone inclusive, apart from its real efficacy as fresh air, will cure no one of consumption. What lamentable havoc have I not seen from phthisis in families that lived within the very scent and hearing of the wash of the sea, but with whom the suicidal practice of shutting out the atmosphere, day and night, from the sitting and sleeping apartments, had prevailed.

The ceaseless concomitant, then, as I must continually urge, of every attempt at removing phthisis, must be the respiration of an ever freshly renewed unprebreathed atmosphere. The veriest nurse, the most ignorant parent, who keeps this grand this indispensable requisite incessantly in view, will have infinitely greater success in the treatment of phthisis, than shall be realised by all the physicians in the world who shall neglect it. In fact, there can be no success without life and effort in the open unprerespired air, or in some place into which the air has the freest access. Even vocal exercises, as singing, declamation, reading aloud, but always in a pure unprebreathed atmosphere, and persevered in daily, will prove most useful. The vital capacity of the lungs and chest may be from time to time determined by means of Hutchinsons spirometer, Sibson or Quains chest measurer, or even a simple tape rule. As deficient muscular effort is an indirect source, so

deficient open air effort further enhances the frequency of phthisis and diminishes the possible prospect of recovery. But exercise, unless in the open air, or in an atmosphere the counterpart in purity of the open air, as a curative remedy, will, as I must for ever repeat, prove worse than worthless, will only exhaust the patient, and confer no compensatory benefit.

Change of air proves useful by raising the spirits of the sick, and by leading them more and more, oftener and oftener, into the pure, ever moving, and in some respects ever varying atmosphere. In any other point of view, it is hopeless utterly to seek for benefit from change of climate. The Almighty, in truth, has placed within our reach, in every clime, the remedy close at hand with the disease. Here is the venom, there the antidote. That climate alone, remarks Clark, should prove useful in consumptive diseases, could only originate in a very limited acquaintance with its influence on disease. Like other professional errors this has descended to the multitude, and one of the first things which people who have the means think of, is to send their consumptive relatives to some tepid clime where, perchance, they languish and decay with yet greater rapidity than they would have done at home. The inscriptions over the dead in Nice Pau Rome Mentone Madeira, are full of instructive evidence on this point. The shores, almost any of them, of our own islands, our mountain slopes and airy downs, our many heaths and moors, will often, if not most times, prove preferable to, while they are much more accessible than is any Nice or Rome or Madeira.

The materials for the possible recovery from phthisis, I repeat, lie around every door. Nature, which is also the divine revealer and interpreter, declares that it is so. The origin and perpetuation of consumption, says Ancell,* in terms of infinite truth and moment, are less attributable to mans constitution and the necessary effects of the agencies which surround him, than to his own negligence and contempt of natural laws, his ignorance, his imprudence, and his folly. In truth, the great majority who labour under consumption, cannot have change of air were it to save their lives. Happily, it

* *On Tubercle*, p. 759.

is not needed. Every requisite restorative influence abounds among ourselves, is in fact close to hand. How often have I seen the phthisical sufferer, by a sort of vital catalysis, begin to recruit and pick up from the very date of his or her removal to, for example, the air of the sea. The food which was previously tasteless, has been partaken of with relish, and strength and powers of locomotion, previously so impaired, have been largely then and there regained. Many, ah, many, might recover could they only be induced to follow up an out-door life, either at the sea side or, *mutatis mutandis*, at home. But getting better, for a space, and esteeming themselves well or at least out of danger, they would not. So, lapsing into their old inveterate ways, they perish. There are, in truth, virtues, subtle as they are inestimable, in the air of mountain slopes and summits, as contrasted with the close reeking environment of houses and towns, which, as yet, we very imperfectly appreciate.

Next to air and warmth the general regimen and nourishment of the consumptive, demand attention. Once, asses milk, tapioca, arrowroot, jellies animal and vegetable, soups, nice enough to taste and smell and look at, but very useless and unserviceable in regard of the maintenance and restoration of the health and stamina of the sick, were all the rage. Meats, roast and boiled, fish and flesh and fowl, both wild and tame, oysters milk curd, farinaceous matters, good bread vegetables and fruit, wine porter brandy, under judicious regulation and management, are all fitting and desirable aliments. Tonics and bitters, cusparia, calumbo, bark and quinine, the various preparations of iron, are all desirable and useful. The saccharine carbonate I wish particularly to commend. In the form of an electuary, as boluses, or in the pills of Vallet, it is sometimes, nay frequently, of marvellous efficacy in anemic white lipped cases. Sparkling wines, to those who can afford them, and effervescing drinks, generally, prove very grateful. I have carried quinine to quinisation, to relieve intermittent fever combined with hectic, with success. Dilute sulphuric acid in orange peel infusion is sometimes serviceable in the colliquative diarrhoea of phthisis.

It is better to eat a regular meal, at regular intervals, say

four times daily, than to eat a little now and a little again, which is apt to disorder the stomach and impair digestion. Ale porter wine or much diluted spirit, is desirable at the dinner meal. As a general rule, a liberal restorative regimen, both fluid and solid, so far as the patient can avail himself of it, answers best, and indeed is indispensable in phthisis.

A few minutes immersion in a tepid bath, at about 80° to 100° F. as commended long ago by the Arab physician Mesue, proves a great comfort in this malady. The spent and exhausted patient finds it often a real luxury. If, however, he cannot bear the fatigue, tepid sponging may be resorted to. Medicated baths, like medicated inhalations, are useless, and with the view of curing phthisis, are simply insane expedients. Some other similar remedies there are which only deserve a like reprobation. The further, indeed, this weary malady advances towards the colliquative period, the less will prove the possibility of recovery, the greater the difficulty even of imparting relief.*

Patients demand a variety of kind offices which it would almost need a sick room code to specify. Competent nurses should alone be employed. No superstitious, untoward, uncheerful, unwholesome influences, alas, I have known them only too often resorted to, should be permitted. In warm weather a mosquito or other net to keep off insects, is advisable. I have seen the sick eaten up, so to speak, with flies, which are with difficulty driven from the decaying frame. All harsh accents, needless noises, and vexatious contrarieties should be avoided. The food ought to be warm and comforting, the service genial and reassuring. The utmost cleanliness, and even elegance, should be enforced. We cannot enough comfort the poor despondent sufferer. And, yet, ah me, even amid these dreary circumstances, under what truly winning and patient guise the heart and soul of man oft display themselves.* How many times have I witnessed fortitude the most wondrous, serenity the most unshaken.

*Je mehr sich dieser colliquative Zustand ausbildet, desto geringer ist die Hoffnung zur Genesung, desto mehr geht alle Therapie bloss auf Erleichterung und Aufschub. Gmelin, *Algemeine Therapie*, Tübingen 1830, S. 302.

*Der Geist und das Gemuth zeigen sich dabei oft von sehr vortheilhaften Seiten. Puchelt, *System der Medicin*, Band II., p. 252.

The period during which tubercle deposits are remediable and removable, passes rapidly away, yet, by always aiming at a cure, we shall sometimes prove unexpectedly successful. But to hope to remove a malady like confirmed phthisis, by medicine only, is the utterest greatest illusion. Emetics of zinc antimony or ipecacuanha will sometimes allay a hacking cough or difficulty of breathing, but will not as De Vittis and others have imagined, effect a cure. Hufeland,* indeed, thought favourably of emetics, and employed them as Galen did the vinegar of squills long ago.† All and any treatment, however, which does not keep perpetually in view the purification of the blood, and the induction of a healthy hematosis, though it may soothe present anguish and calmly conduct the sufferer to the gates of the tomb, will else be of no avail. There must indeed be a ceaseless habitual respiration of unprerespired air, since without this, all remedies must prove vain.‡ No, there is no treatment except a thorough treatment. Physicians, the great suffering community, itself, will groan over the inefficacy of medicine until we learn to appeal, unconditionally and unreservedly, both in respect of the treatment and the prevention of the malady to nature, in fine, have recourse to the incomparable, the saving efficacy of pure oxygen in the only form in which it is adapted for our use, namely, the ever unprebreathed and untainted open atmosphere.§

PREVENTION OF CONSUMPTION.

In order to delay, efficiently, and if it may be avert the development of a disease, its cause must be ascertained, its source must be assailed. We must, indeed, attack the root of the evil, neutralise its death dealing agency.‖ Important as has proved the benefit of vaccination and that of those other great physiological and pathological discoveries, yet greater, almost infinitely greater, at once for the individual and the

* *Handbuch*, Zweiter Theil.

† Απὸ του φαρμακου τουτο θεραπευθέντας.

‡ Sine illo manca sit et claudicet medecina. Sydenham.

§ Laudantur remedia complura infallibilia, sed tabulae mortuorum artis inefficaciam demonstrant. Bene, *Elementa Medicinae Practicae*, Pestini 1834, Tom. IV., p. 275.

‖ Pujol, *Effets du virus Scrophuleux sur l'Economie Vivante.* Paris 1795.

species, would prove the utility of staying the frequency and if possible getting rid of consumption altogether. This possibility I firmly confidingly and unhesitatingly assert. If our measures were only based on a rational pathology, the inevitable result would be a proportionate abatement in the frequency and fatality of an infinitely disastrous and hitherto entirely inscrutable disease, while the ravages of consumption, at present the opprobrium of the medical profession and the disgrace of our intelligence, like those of scurvy smallpox fever leprosy plague, would become the theme of historical comment and posthumous wonder. The very best, and only real prophylactic, then, is the unintermitted respiration, day and night, of a pure unprebreathed untainted atmosphere. If this were only continually respired, there could be no consumption no scrofula, because no tubercle. There is indeed a border land of disease where consumption has not actually broken out, but where it is continually imminent. Pure air is respired, at intervals, but not sufficiently respired to realise sound health. Foul air too is respired, yet not sufficiently respired, to induce actual tangible disease. Such cases are of necessity numerous. Many spend their days, and live and die, without exactly knowing of what they ail, not feeling sick enough to complain, nor yet well enough to be well. This neutral state, however, assumes a terrible significance if we consider that it must and does precede all actual outbreaks of consumption, whatsoever. The disease, if not actual, is yet imminent. Thousands of human beings throughout these islands, not now labouring under consumption, will, nevertheless, display the frightful symptoms of a most disastrous malady within the year. This, then, is the especial stage in which the mighty aid of medical science and medical skill may be invoked with a well grounded expectancy of relief. In such subjects, a little more confinement, a little more continuous respiration of the poisoned prebreathed air, suffices to generate the tubercle taint with fatal celerity. Often and often may we avert, as often and often I believe I have averted, a phthisical outbreak in persons whose parents brothers or sisters had already fallen victims to the disease. Let us be assured that our power, in this respect,

need only be limited by our effective employment of rational principles of prevention, and a full and perfect compliance on the part of patients in carrying them out. It is not the occasional respiration, but the more or less continuous respiration of the foul prerespired air, that entails the dread result. Yes, the removal of injurious influences, above all the cessation of the habitual respiration of an atmosphere already tainted by the products of the breath, would often alone suffice to restore good health. This is a theme on which I might here long descant. There are thousands and tens of thousands who, although they do not labour under tubercle, yet, by reason of neglecting the golden moment, are as prey ready prepared for the spoiler. They are those on whom consumption has not already seized. They are the one hundred thousand souls who, in these kingdoms shall presently, alas, replace the current victims of the dread destroyer.

Those with the pale and sallow countenance, the swollen abdomen, the cold and tallow hued extremities, the bent nails and tumid finger ends, the flatulent bowels, the white tongue, the foul breath, the soft muscles, the languid weak dispirited inactive torpid breathless multitude, let us, then, without a moments delay remove from their sickly state, and, while it is yet time, plunge into a healthier wholesomer environment. So long as tubercles are not perchance largely formed, and the blood haply is not too much tainted, it is not only probable but often certain, with proper means and appliances, that consumption, that scrofula, in a word tubercle, may be entirely kept at bay. Let us only urge incessantly the respiration of an untainted unprebreathed atmosphere, let us but amend the bent and sedentary posture, alter indolent habits, supersede unwholesome pursuits. Out of a thousand cases of consumption annotated by Lombard, four hundred actually followed a sedentary stationary or stooping life.* With Ramazzini and Morton let us not suffer the weakly mother to suckle her infant, unable therefore to leave the house, to her own premature destruction. With Holland

* De l'influence de certaines professions sur le Développement de la Phthisie. *Annales d'Hygiène Publique*, Janvier 1834.

and Thackrah let us withdraw the grinder from his den and dusty stone. And with Alison let us substitute the automatic agency of steam, the water wheel, the fan, the endless saw, and the steam chisel, for the deadly hand chisel of the mason. Workmen, more especially weavers, indeed all indoor handworkers, are scourged with the swellings scars and hideous deformities of scrofula.* Machinery should, in fact, be substituted for every fatal dreary monotonous unwholesome toil. For the sequence and regularity, otherwise so pleasing and desirable in the machine, are in this instance, simply death and destruction, in the long run, to the man.

The agencies, whatever they may prove, which in the course of his career act injuriously on a human being,† should be modified in his behalf. There is an utter absence of corporeal exercise in the Lycées of Paris and French Government schools, generally, with the exception of the preparatory school of Vauves, lately incorporated with the Lycée Louis le Grand. Hector Malot in a recent communication to M. Daruy with a view to the introduction of the liberty and manly games of the English schools, states that from six o'clock in the morning to eight in the evening the boys of the Lycées, from the age of eight to that of eighteen, are seated on a bench, bent over their desks, rigid silence and attention being required of them. They never play ball, or skate or jump or run,‡ and all this, be it observed, coupled with crowded schoolrooms, and dormitories with closed windows. Could anything well be more monstrous. Could anything be more absurd. It is no wonder that tubercle so ravages the fair soil of France. The more a boys corporeal powers are exercised, reasonably, the greater will prove the development of his mental faculties, the more absolute will be his immunity from tubercle. Let us then correct the vice of assimilation§ which leads to the formation of tubercle. Let us attend to the digestive and cutaneous functions and greatly multiply every desirable out of door pursuit and recreation.

* Lewis, *Report on the Sanitary Laws and Ordinances of France*, London 1855.
† Durante il corso del viver suo. Brera, *Prolegomeni Clinici*, Padova 1823, p. 25.
‡ *L'Opinion Nationale*, Feb. 1865.
§ Vizio d' assimilazione organica. *Patologia Analitica*, Pesaro 1830, T. II., p. 423.

Let us bring air fresh, unpolluted, unprebreathed, day and night, into every dwelling, and, so far as may be, render it impossible, even once, to respire a foul corrupt already breathed atmosphere. Let us encourage the fullest freest respiration in the open air. Singing, like dancing, is desirable, but then it should be practised in an unprebreathed unpolluted atmosphere. For every occupation, however innocent in itself, otherwise becomes ruinous in the extreme. Let us further amend the position of houses and of sleeping chambers. Let us attend to the secretions and excretions, enforce the habit of the bath, improve the processes of ventilation, in fine, renovate the blood. Nothing save our utter prior ignorance as to the nature and pathology of phthisis, could ever palliate the employment of effete and useless, if not positively injurious and hurtful remedies in the treatment of the consumptive.

The narrow sordid abodes, the persons and habiliments of the poor, are charged, saturated, with mephitis and soil, ruined by neglect. Scrofulous tuberculous outbreaks spare no portion of their miserable frames. The closer and worse ventilated are their dwellings by night, the greater also become the number of phthisical cases, the more urgent the assaults of tubercular disease. In any and every instance the indication is the same, namely, to avert the evil altogether, or if that be not entirely practicable, as soon as possible to set it aside and to remedy the results. We have to provide for the elimination of impurities from the blood, the rectification of abnormal processes, and the ceaseless inhalation of a pure unprebreathed atmosphere. All remedial, all prophylactic treatment, must alike fail, that pays no heed, or no sufficient heed, to this. Either we must prevent the dread incursions of phthisis or suffer them, by our default, to continue their ravages unchecked. Nothing can prove of any the slightest efficacy, that does not include the inhalation, ceaselessly, of an atmosphere exactly as God, as nature, supplies it so amply and incessantly for our use. All other remedies, this being left out, are simply preposterous and insane. Man and brute, we lie under an absolute physiological necessity of breathing unprebreathed air. Even plants, as all the world knows, will not live unless in a fitting

atmosphere. Bring a plant, only bring it, I say, into the ill aired, ill sunned hovel, the close and fusty bed or sitting chamber, and forthwith it blights and withers, even as man himself is blighted and withered when he is placed in a like disastrous neighbourhood. We must, perforce, conform to natures conditions. To what she exacts it is vain to say nay. Palter as we will, nature abates no jot of her requirements. Our miseries in respect of tubercle and tubercle begotten inflictions, arise from our rejection of these requirements, and our most unwarrantable substitution of some vile insufficient and altogether unnatural arrangement of our own. Nature does her utmost to benefit us, but we violate her injunctions, we turn a deaf ear to her entreaties, we reject her commands, and so render it impossible either to prolong life or set aside disease.

But the one great thing needful, the arcanum of arcanums, in respect of this vilest and most needless malady, is the complete prevention of tuberculous deposits. No one, let us be assured, ever contracts consumption, without first labouring under tuberculous blood. And no one, let me add, labours under tuberculous blood, without the prior respiration of already breathed air. If we truly prevent the tuberculous habit or carbonaceous degeneration of the blood, we prevent tubercle. And most assuredly, nothing, under heaven, potentially speaking, any habit custom imagined necessity or artificial constraint to the contrary, notwithstanding, is more completely at our disposal. The business of education of training and of life, must of course be carried on, and with constancy and assiduity, but without any coexisting incumbency of sacrificing health, whatever. How absurd to suppose that intermittent fever, that disease, should avert consumption. Hamont found phthisis and intermittent fever jointly persistent in Egypt, while I and many others have known them conjoint here.

As cold does not occasion, so neither will heat remove phthisis. Phthisis is endemic both in the East and in the West. For it is prebreathed, and not merely warm or cold, air, that occasions tubercle. If the air be only prebreathed, whether it be warm or cold, phthisis will equally follow the

continued respiration of such air. And if the air be not prebreathed, neither will consumption for a moment follow whether at the equator or the poles. Respirators so named, *lucus a non lucendo*, do not further, but simply impede respiration. Respirators, indeed, do not avert consumption. They warm the air, forsooth. What, then, cold air does not cause phthisis, but only prebreathed air, and this the respirator is not supposed to change. In fact, respirators hinder respiration. I should suffocate were I constrained, as many a poor ailing tottering being is constrained, to wear one. The mouth nostrils and bronchial tubes warm the air enough in its descent to the lungs, where, by a most wondrous provision, a large supply is further retained not only for warming the inspired air but for the purification of the blood. If we must have a respirator, and a really admirable one, let us close the mouth and breathe through the nostrils. If any artificial respirator could do good, it would be a charcoal respirator, useful indeed for many purposes, but not for removing or preventing consumption. The more freely and openly in fact we breathe, and the purer and less prebreathed the atmosphere we respire, the greater will prove our immunity from tubercular disease. The barest bleakest hillside is better, *per se*, for these salutary purposes, than are the means and appliances of any hospital. In fact, the idea of an hospital, as such, for curing consumption, is simply a pathological solecism. For as hospital air, indoor air of any kind, unless most carefully and ceaselessly renewed, serves but to foster tuberculous disease, it should not be had recourse to short of the exercise of every, the utmost, precaution. There must be daily vigorous, and not merely passive open air life and action. These are the antipodes of tubercular disease, a soil where tubercle cannot thrive, where consumption cannot come. The exceeding, nay, the infinite import of open air life and effort is apparent from the fact, already adverted to, that one third and even more carbonic acid, besides other lung impurities, is given off during exercise than when the body is passive. Any kind of movement, provided only that it shall be in the open air, provided that it shall secure the needful wholesome metamorphosis of tissue and the oxida-

tion of the effete waste, as riding walking running jumping vaulting rowing, boxing with gloves, fencing swimming, not carried to excess, is desirable, for health after all is an unspeakable good, conducive in the long run to happiness and usefulness. Life in a pure unprebreathed atmosphere, with its respiration at all times and places, averts consumption irreversibly. This is more than can be said, were it in a single instance, of the seventy or eighty tons of fish oil yearly consumed in England, or the six hundred gallons of the same ineffective substance annually it has been said employed in the Brompton hospital. Nay, all the codfish that swim the mighty ocean, were they converted into oil, could not, would not, relieve or avert, were it but in a single instance, consumptive tubercular decay.

The utility, duly regulated and adjusted, of gymnastics is very great, not so much, however, by rendering people alert and vigorous, as by promoting the needful wholesome metamorphosis of tissue and by taking them into the open unprebreathed air. Why should we sacrifice the precious present to the uncertain future. Nothing, I say, should be omitted to secure our present and prospective good. How absurd, then, to talk of the clog of matter. Matter here, at least, is no clog at all, unless when through utter folly and neglect it becomes diseased matter, but the indispensable means and condition of our corporeal and mental wellbeing. It should, therefore, and for every reason, be maintained in sound vigorous working order. Impressed with this great necessity,* there was opened at Germantown, nigh Philadelphia, an academy uniting bodily labour with academic pursuits. The Report speaks in high terms of the talent health and habitual industry of the inmates. The half time system in schools is a move in the same good and wise direction. There can, in truth, be no real civilisation till the body shall be better cared for than it is. Youth is the natural season of health activity and grace, nor is there any the faintest pretext for associating human wellbeing and human progress with needless suffering or a single tear.

* Caldwell, *Thoughts on Physical Education.*

Again and again must I insist that bodily effort, with a view to health strength and longevity should be open air effort, and open air life, else it cannot, will not avail. Any amount of indoor exercise in air more or less prebreathed may be taken, but it will not avert tubercular degeneration or suffice to remove it when it has ensued. Sailors become oftener tuberculous than is imagined, in consequence of their horrid sleeping places. Prize fighters, too, after having undergone their training, and won or lost their fight, not infrequently, owing to the unwholesome lives they lead, become tuberculous and die. Thus, some of the very strongest and most admirably formed men I have ever known, perished tuberculous. Foul chambers and air prebreathed, in truth, would destroy a giant. No strength, no stamina, can here avail. The inmates of our close fetid menageries, though in pretty constant motion, breathe prebreathed air, contract tubercle, and so perish. The cow, too, when kept in a close confined atmosphere, uniformly incurs this vile degeneration, and would die, likewise, only that she is slaughtered, beforehand, in order to become worse than indifferent human food. But the cow that lives afield, the cow that browses on the lea pasture, and occupies a well ventilated open cowhouse, never becomes tuberculous, never. The *muscardine* that destroys the silkworms of France and Italy, and so distracts and distresses the unhappy silk growers, is no other than tubercle. In the Jardin du Roi, at Paris, the apes, as we are told by Blainville and Reynaud, that abode in magnificent but ill aired cages, perished of tubercle, though gamboling according to the wont of their species from morn till eve, while those that lived in open sheds, merely sheltered from the east and north east winds, enjoyed immunity. If a person will but occupy three or four hours daily with active open air life and effort, and sleep in a chamber the windows of which shall be pulled down winter and summer, the night through, he may bid defiance to consumption and scrofula for ever and for ever. So all important is the respiration of a pure unprebreathed atmosphere, all night long, that I should freely stake the prospect of health upon its observance, alone, before and beyond any and every other means which omitted this most

desirable and indeed indispensable requirement. There can be no security for health and life without a perfect and complete bedroom ventilation, nor any certain escape from phthisis, whenever and wherever bedroom ventilation in some efficient shape or other is neglected.

The practice of confining young persons of either sex, for long hours immoveable on their seats, is simply brutal, fraught with every ill. To be up and doing is ever the cry of nature to the young. If we would preserve boys and girls in health and stamina, if we would avoid consumption and its train of horrors, we must not only permit but enjoin it upon them, to spend hours on hours daily in the open unprebreathed air, and sleep in a chamber absolutely at one with the unprebreathed outer atmosphere.

We owe to the young, whose pursuits and occupations will be prosecuted all the better by the possession of exquisite health and stamina, this mighty, this priceless boon. It is foreign to my task to point out in this place all the disastrous results accruing from an imperfect ill developed physical life. Yet, as further ancillary to the great object I have already insisted on, each young person would do well to learn some suitable handicraft, or better still a number of handicrafts. To some, they would prove a recreation and a solace, to others a resource, to all a means of health, and, added to the recommendations I have already urged, almost a certain safeguard against disease. Muscular aptitude and development, as thus, assist the proper discharge of the functions of respiration, as well as tend to the better preservation of health and life themselves. When exercise, indeed, is taken unwillingly, if taken at all, and when the pursuits of indoor life are prosecuted in an impure, a prebreathed atmosphere, consumption and death but too surely follow. Such are the sources of tubercle, and such, too, are the sure and certain means of averting, and so far as may be of remedying it.

Thus, then, would I fill up a lamentable hiatus in our knowledge of disease, as well as supply a hitherto missing link in the long chain of physiological law and pathological inquiry. I would establish a habit and a law of health, instead of a

habit and a law of disease. I would substitute health for want of health, supersede a disastrous and hitherto remediless scourge, which, if remediable and preventible in one man, is, therefore, in virtue of the unity of the divinely imparted laws of life and organisation, remediable and preventible in all men and all breathing creatures.

ON TUBERCLE.

Read before the Edinburgh Medico Chirurgical Society, 20th May, 1856.

Tubercles do not spring up casually, as it were, but from some fixed, regular, certain, and, therefore, ascertainable cause. There is, in strictness, nothing like chance, nothing fortuitous.* The prevalence of certain maladies implies a like persistency in the infraction of some organic law or laws. Yet, the causes of morbid conditions, when appreciated, are generally of extreme simplicity. Some diseases, as hydrophobia, plague, Indian cholera, so far as we know them, result from specific infections communicable from man to man. Once introduced, the virus in each instance is capable of renewing itself in the living organism. In all these cases the origin is obvious. The symptoms, severally, are referable to a poison. And when we describe the manner and the order of these symptoms, we have gone as far, in respect of the natural history of the malady, as, in the present state of our knowledge, it seems possible to go. There are other diseases, however, not springing from infection or the operation of a specific poison, as, for example, those ensuing from cold, suddenly suppressed cutaneous transpiration, suppressed renal excretion, transport of pus into the circulation, in which the mode of action is also simple, and the accruing results in general perfectly obvious. I do not, nevertheless, mean to say that all the phenomena of disease are invariably susceptible of being understood. I only mean to say that, in certain cases, the etiology is alike plain and intelligible. So often is this so, that we may very safely infer that when our pathology is laboured, ambiguous, compli-

* In mundo non datur hiatus, non datur saltus, non datur casus, non datur fatum.

cated, it is in all probability erroneous. In the successful investigation of disease, the usual current of successful investigation is almost invariably from many particulars to few, from the complex to the simple. Every one who is in the habit of turning his attention to such subjects will be able to adduce examples, in illustration, for himself. Although I would not affirm that the simple must always be true, I unhesitatingly aver that the true is always simple. The invariable course of science is from a multitude of details to a very few, from vague unsatisfactory and profuse hypotheses, to some one single perspicuous and sufficing theory. Numerous factors are at first assigned. These are progressively reduced in number, eliminated, till, at length, they amount to a very few, or, perchance to but one.

I am quite well aware of the occasional ambiguity of teleological reasoning, as it is termed. Still, I think that such reasoning has been too much excluded from the pale of medical science. Must it ever be deemed unbecoming, or at least undesirable, to try and determine what may be the intention of a beneficent, and intelligent Providence. I think not. For teleological considerations, judiciously correlated with sound facts and a living theory, in many cases, I conceive, throw a yet clearer light on the origin and progress of disease. The Divinity stands forth, as it were, in aid of medical science, and in our efforts at prevention subserves at once our sagacity and our research.

It demands little reflection to show that the epidemies which have devastated Europe any time these two thousand years, must have ever sprung from violent and sustained infractions of some hygienic law or laws. Most indubitably they did so. There was an infraction in the first instance, as in the last, of the laws of the living organism. The results were an intensity of consuming disease, at once distressing to humanity and subversive of calm reflection. These inflictions, the black death as it was termed, among the rest, were but multiples of single instances of the violation of conditions which alone are compatible with vitality, organic regularity, and health. Multiplicity and magnitude, indeed, terrify the child, but they

also appal the man. The pustules of the discrete small pox on a single individual, a carbuncle, a bubo, or a more than usual watery stool, alarms no one. Let these phenomena, however, instead of affecting a few individuals, extend to myriads, and horror and confusion become coextensive. Yet, it is only when we study and understand disease in the individual, that we appreciate it in the mass. When we determine, I say, the manner of the production of a single tubercle, in a single person, we determine it, likewise, in the whole species. Once we are enabled to ascertain the source of a disease, say tubercle, for it is of this morbid degeneration that I would here speak, not only do we exercise that scientific prevision in respect of it, which is the characteristic and criterion of all science, but we also act in aid of the very providence of God which assuredly intends that man shall be not sick but whole. And in duly estimating the sources and conditions of tubercular degeneration, we shall also be in a position, one day *in posse*, if not always, *in esse*, to anticipate, and with entirest certainty to prevent it.

The causes hitherto assigned, in truth, for the production of tubercle, evince all the vagueness and uncertainty which distinguish that transitional state of medical science which antedates rational demonstration and inquiry, the period when the unsatisfactory and too often vain and delusive hypothesis has not as yet given way to the well based, conclusive, and ample theory. The number, the variety, and the uncertainty of past hypotheses render them, for the most part, reciprocally destructive. Tubercle, it matters not whether pulmonary, cutaneous, cerebral, osseous, spinal, arthritic, or mesenteric, it has been said, is hereditary. Yet, there is not a shadow of reason for this hypothesis. For the extreme frequency of tubercle, itself, and, of course, the liability of the offspring, when placed in suitable circumstances, of the tuberculous, in common with others, to the infliction, of course yields none. That the infant *in utero* should, in a very few instances, become tuberculous, affords no plea, for the infant *in utero* is exposed in a measure, yet with a very remarkable safeguard and protection, to the consequences of the unhealthy conditions under

which the female parent, herself, laboured. Those who die tuberculous are not necessarily born so, for few, indeed, are born tuberculous, and even then, the infliction is not hereditary in the sense that is contended for. A theory, to be valid, must suit all the cases. It is absurd to assign a number of causes when one is found to suffice. To say, then, that tubercle is hereditary, is merely to evade the question. The tuberculous mans father had, it is alleged, tubercle. Very well, but what made the father or the fathers father tuberculous. Why, his father, it will still be said, was so, and thus the ball is driven along, much after the fashion of the story of Eastern cosmogony. The world, quoth the Hindoo, rests on an elephant. Very well, the elephant on what. Why, on a tortoise. And the tortoise on what. Here, however, the Hindoo, like our hypothesis is silent.

Again, tubercle, it has even been held, is infectious. This, however, is yet more unsatisfactory than the elephant and tortoise cosmogony. Did any living being ever contract tubercle by inoculation, or from contact. The thing is simply impossible. We might just as well try to inoculate a broken leg. Tubercle, in fact, is in no wise communicable. Some one, we shall say, after prolonged attendance on a sick relative, contracts tubercle. But this result does not spring from contact, but ensues only because the circumstances are otherwise provocative of tubercle, and because tubercle would be contracted were there even no second tubercle infested person in the particular instance at all.

Bad food, bad nutrition, dyspepsia, all induce tubercle, say some. But dyspeptic people are only sometimes tuberculous. How is this. When they are so, it is in fact because they have been exposed to the causes of tubercle, which are in no respect the causes of dyspepsia. Dyspepsia *per se* never induces, never did induce, tubercle. During periods of famine the unhappy victims perish of want, but not of tubercle. It is not a vice of nutrition nor the absence of nutrition that induces tubercle. Opulent multitudes die every year of tubercle, multitudes who not only never experienced dyspepsia, but never suffered from an ungratified material want in their lives. No,

neither dyspepsia nor want has anything to do with the production of tubercle, any more than have cold and moisture, causes still more frequently alleged, and if possible even more illusory. What numbers are exposed to cold and hardship, and want and moisture, and, yet, perchance evince no single trace of tubercle. How common is tubercle among the many who never, so to speak, were exposed to cold or hunger or hardship at any time. How various, contradictory, and unsatisfactory are these pretended causes. How greatly do their issues clash with each other and with the facts. No, none of them, whether severally or collectively, in much or in little, have to do with the production of tubercle.

The conclusion, then, to which my inquiries and observations all lead, is that the cause, the only cause, of tubercle is a vice of respiration. A single sufficing cause, says Bacon, is enough. To be sure it is. If the respiratory functions be properly performed, if the conditions prove normal, there is, there can be, no tubercle. Under no conditions, else, whatever, the conditions of respiration being healthy conditions, shall tubercle ensue. These healthy conditions as respects respiration, however, being habitually violated, the eventual and inevitable result is tubercle deposit, now in the lungs, now in the lymphatic more especially the bronchial glands, the larynx bones joints spine, the mesentery and its glands, the meninges brain liver spleen pancreas ovaries testes. There is a certain lesion of the function of respiration induced by rebreathed air, hence tubercle. For to suppress the function of an organism is to disturb the harmony and unity of its parts, and so bring about its destruction.* It is impossible for healthy respiration, or healthy life, to take place in an unhealthy, stagnant, prebreathed atmosphere. If we respire an atmosphere that has been respired before, by ourselves or others, and the oftener it is respired the more unfit for respiration does it become, the proper congress of the oxygen of the atmosphere with the metamorphic waste is interfered with, oxidation is more or less impeded, the tissues which have undergone retrograde metamorphosis are not sufficiently elimi-

* Vera, *Philosophie de Hegel*, p. 121.

nated, and the animal detritus, no longer properly expelled by the outlet of the lungs, nor adequately got rid of by any vicarious outlet, is detained in the blood. And yet here it must not stay. The wholly unorganised and effete waste cannot be employed afresh, and hence it is laid down, dead, and unorganised, as what pathologists term tubercle, throughout the entire economy, wherein it is productive of the evils and disturbance, the torture and the distress, ending finally in disorganisation and death, which any other dead and unorganised matter, foisted to the same extent amid the living tissues, might be expected to superinduce. In this product there are, indeed, neither vessels, nor canals, nor living-structure, nor fibres, nor laminae, nor anything, in short, that recals the idea of organisation, or life, both of which, in fact, are completely absent.* These conclusions are entirely supported by all well founded physiological and pathological data. Nor is there anything in the conclusions of Lehmann, Valentine, either of the Simons, or Rokitansky, or in fact any physiologist or pathologist, which contravenes, but, on the contrary, much to enhance and sustain them.

There are ever two great processes, remarks a philosophical observer, going on simultaneously in the animal economy, namely, the formation of new, and the elimination of effete tissue, which, last, then becoming foreign to the organism, cannot without danger be long retained.† Histological inquiries, however important in their place, here can only lead to negative results. They serve, indeed, to show that tubercle is amorphous and unorganised, so far, at least, as dead waste is so at any time. It needs, in truth, physiological investigation to determine the nature and conditions of the healthy vital processes, and pathological investigation to show how far these processes are invaded and how far interfered with. The result of this joint investigation, I submit, is not to be shaken, and the inference as to the formation of tubercle in the manner for which I here and elsewhere contend, complete.

The importance of a pure atmosphere has been more or less conceded by medical and other inquirers for at any rate the

* Andral, *Clinique*, Tome ii. p. 12 : *Pathologie*, Tome i. p. 430.
† Comte, *Philosophie Positive*, Section, Philosophie Anatomique.

last two hundred years. The admission, however, was made, as it is too generally still made, on grounds at once vague, unsatisfactory, and empirical. It is no easy matter observed Mayow, some two centuries ago,* to determine the uses of the respiratory act. Servetus, the Spanish martyr, long since in fact pointed out how the blood came in contact with the atmosphere, was purged of its impurities, and assumed a scarlet hue.† It was admitted that pure air was desirable, nay, the senses bore their evidence as to the fact. But beyond their immediate testimony not many went or in truth cared to go. How or why, exactly, pure air was requisite, few ventured, and fewer still were competent, to inquire. Even at the present day, misconceptions the most singular continue to subsist. And, yet, the testimony of many observers is extant as to the production of tubercle from the habitual respiration of an impure atmosphere. But I have gone further. I have for the first time shown that not merely an impure, but a prebreathed atmosphere is the one constant factor, the agency, in short the *causa sine quâ non*, without which not only can there be no tubercle, but which, being present sufficiently often and sufficiently long, invariably induces tubercle in one or other of its multitudinous forms. We continually witness the production of tubercle, thus, in our own species. Indeed, we can induce tubercles at any time, in the lower animals, by subjecting them to the conditions aforesaid, and by inference as well as direct observation arrive at certain means of preventing them in man. The evidence in favour of these conclusions is of the most varied, demonstrative character, and goes to show that the atmospheric deterioration productive of tubercle, is consummated within doors, and very particularly, if not exclusively, in the sleeping chambers wherein so large a portion of our existence is passed. In short, air previously respired and imperfectly, if at all renewed, is the ever active, necessary, inevitable, and only precursor of tubercle.

My experience of tubercular phthisis has been most extended. It has only been during the more recent portion of that experience, however, that my attention was directed to

* *Tractatus duo de Respiratione*, Oxon. 1669, p. 36.
† Restitutio Christianismi.

the production of tubercle from the habitual respiration of an ill renewed, but above all a previously breathed atmosphere. During these latter years I have met with no case of phthisis, none of scrofula, in short no single instance of tubercle, whatever, whether in man or brute, which did not, upon investigation, turn out to have the antecedents already insisted on. A dwelling may be comfortably, nay luxuriously furnished, cleanliness the most perfect, taste the most exquisite, may reign within, the apartments may be at once spacious and numerous, yet, unless pure unprerespired air be of the appointments, the rest will not avail. There is no substitute, I most emphatically declare, for an incessantly renewed unprerespired atmosphere. It is frequently stated that, as consumption occurs even at great elevations, and in houses where the surrounding atmosphere is most salubrious, the condition of the air, therefore, has nothing to say to it. This, however, involves a *non sequitur*, and a very great misstatement. The genesis or non genesis of tubercle has nothing in the world, directly, and hardly anything, indirectly, to do with elevation. Tubercle may occur at any elevation, and its absence may be secured at any elevation, or want of elevation. It is of little avail, in respect of the production of tubercle, what sort of air subsists outside the dwelling when the air inside is impure and unrenewed, any more than it signifies to the famished prisoner that the richest viands lie spread outside his dungeon wall. Of what avail, indeed, is pure air to the panting lungs, when barriers of brick and stone and glass exclude the life renewing element.

Of cases such as the following I have witnessed, alas, very very many. I visited a young lad at the instance of his ordinary medical attendant. Both lungs were tuberculous, but the left was much more so than the right. The signs and symptoms, the dulness on percussion, the cough, the spit, the hectic, the emaciation, and the distress, were all those of tubercle of the lungs. This lad was just fourteen. I asked him, among other things, to show me the room wherein he spent his nights. He led me to a small apartment, where the chimney was bricked up. The lower part of the window would open a little, but the

upper portion, as too commonly happens, would not open at all. Although the door was ajar, and air had been oozing in from the time of getting up, the dreadful odour, or rather stench, resulting from the nights occupation, was but very partially dissipated. Upon being further questioned, the lad informed me that he had only occupied this room, along with his little brother, for seven nights. Show me, then, I said, your previous apartment. Whereupon he took me to a yet more elevated chamber, with a low coved ceiling, and a window that did not open above, that was never, indeed, during sleeping hours, at least, opened at all below. The chimney was carefully plugged with a truss of hay, round which some coarse linen had been wrapped, while the bed curtains were drawn, as in the lower room. And, here, amid the foul and again and again respired atmosphere, this poor lad had slept for the preceding twelvemonth, and, here, too, was formed that deposit of waste in the lungs which brought his career, as it brings that of so many others, to an untimely close.

If, as I affirm, every form of tubercle result from the habitual respiration of an ill renewed, previously breathed atmosphere, leading to the retention, instead of insuring the expulsion of the effete carbonaceous tissues of the living organism, it necessarily follows that, by reversing this unhealthy condition, the prevention of tubercle lies completely at our disposal. So long as the lungs are in a position satisfactorily to perform their duty, there will be no retention of the dead metamorphic waste, and, consequently, tubercle, which, as I assert, and assume to prove, is no other than this waste, will not be deposited, or if deposited, haply, perchance, removed. Thus, some years since, I was consulted about the children of a Mr. C. Under the ramus of each jaw, of all of them, and beneath the chins of some, copious tubercular deposits, a portion of them the size of walnuts, had formed. To what extent tubercles subsisted, internally, I had no sufficient means of ascertaining. They lived in a beautiful and admirably placed country seat, and, yet, their sleeping chambers were low and airless, utterly, while they were chained to lessons all day long, and most mistakenly ill nourished in their opulent home,

besides. Instantly, I pulled their chamber windows down, and kept them so, day and night and always. I clothed them amply and well, and sent them, gamboling with ecstasy, out for four hours, daily, upon the green. I carefully regulated their food. I gave the poor little anemic scrofulous creatures suitably adjusted doses of steel. So soon as the season was somewhat farther advanced, I packed them off to the sea strand, there to frolic up and down each day and all day long, and when night came, to sleep in chambers with the windows opened well. Ere winter again came round, the tubercles had all disappeared, and vigorous rosy children replaced the pallid etiolated weedy things that formerly bore their name. They have since arrived at man and womans estate. I see them, sometimes, but, to all appearance, they and tubercle have parted company for ever.

A poet* has imagined with startling vividness and distinctness, a shadowy Napoleon calling up and marshalling his perished legions from their graves. But, ah, what pen, what imagining, could evoke from theirs, the multitudinous hosts, hosts in numbers like the seashore sands, that tubercle, undetected, misunderstood, that consumption, has doomed to die. Yet, everywhere, God and nature furnish the conditions essential to physical wellbeing. We may not with impunity violate the laws of the economy. We cannot long sustain the privation of unprerespired air. If the inhabitants of Great Britain and Ireland would but consent, day and night, to live in a pure unprebreathed atmosphere, it would put a total close to the ravages of consumption and scrofula, white swelling, tabes mesenterica, water on the brain, in fine, the whole abhorred family of tuberculous disease. The very purest air, by day, will not suffice without pure air by night, also. It is not necessary to spend all the time in air fouled by respiratory impurities to induce tubercle. If the nights be passed in some stagnant airless chamber, it will but too surely consummate the work of destruction. We must do away with our curtains, pull down our glass screens. Windows are meant for the admission of an unprebreathed atmosphere, and not merely to

* Heine.

keep it out. So earnest is nature to promote our welfare, that she actually intensifies the action of oxygen, in the shape of ozone and antozone, for the better destruction of impurities without and within the organism. Abundant ozone is wafted into our towns, but none can be detected there. It is copiously inhaled and even swallowed, too, if we only frequent the breezy hillside and pitching billow, but it is quite absent in the expired breath. So long as American settlers live in open shanties, they never ail even in the coldest weather. But once they abide under ceilings and in close chambers, scrofula and consumption, like the evil spirits of the middle ages, also take possession along with them, and raven as they do elsewhere. By day, indeed, we can only sometimes, safely, in this so often cold and wet and stormy climate, sit or work at or with open windows. But open windows, year in year out, we must have, by night, on pain of natures most serious displeasure.

Under all circumstances, then, the one thing, especially needful, is to stop, stay, and prevent the tubercular degeneration, altogether. Collateral, remedial measures, diet, clothing, exercise, and tonics, of course, will take their place. The simple problem which we have to solve is, how, day and night, to furnish air unsophisticated unprerespired pure as the organism demands it, pure as is the great body of the atmosphere, itself. There are but two ways of effecting this. One, is by admitting uncontaminated air day and daily, night and nightly, into our dwellings. The other is by living much in the open ocean of the atmosphere. People, as yet, are undecided, and indeed it is still matter of uncertainty, as to the best means of effectively securing house ventilation by day. At night, however, there is no difficulty or ambiguity, whatever, about the matter. It is only necessary, more or less, according to the state of the wind, to pull down the window, freely, and, except while dressing and undressing, to keep it down, winter and summer and always. With warm, abundant night coverings, there is not a shadow of risk. There is none of rheumatism, none of bronchitis, in short, no risk whatever. The only, the real risk which we incur, is that of closing our sleeping chamber

windows, of debarring ourselves of pure air during our repose. We spend so much of our short life in bedrooms, that with a pure bedroom atmosphere, pure and fresh, in fine, as is the outer atmosphere, itself, for here nothing less will suffice, there would, as I affirm and maintain, and, with all my convictions believe, with reasonable care and attention, otherwise, be no tubercle, and consequently no scrofula, no consumption whatever. With this care and this attention, consumption and scrofula, in other words, tubercle, are just as preventible as are broken limbs, or burns, or scalds, in short, any given casualty. But nothing short of this care and attention will suffice. We must realize in our dwellings, if no other, the one indispensable requirement of an unadulterated, incessantly renewed, and, consequently, unprebreathed atmosphere. This so desirable hygienic revolution being once consummated, our hands would be freed from tubercle in all its protean multitudinous aspects, and we should be left at comparative liberty to deal with the remaining, and, unhappily, all too numerous forms of preventible organic and functional decay.

LETTER TO THE MEMBERS OF THE IMPERIAL ACADEMY OF MEDICINE.

PRESIDENCY OF M. LAUGIER.

Translated from "L'Union Médicale," 15 Mai, and "Gazette des Hôpitaux," 20 Mai, 1855.

GENTLEMEN,—I have the honour to submit my treatise on pulmonary consumption and scrofula,* diseases which have long been the subject of my earnest study, and in respect of which I have undertaken a lengthened series of observations and enquiries. My object has been to demonstrate the exact source of tubercles, to remove them, if possible, in certain cases, but especially to arrest their growth, and prevent their formation altogether. To do this, would be to fill up a vast gap in the knowledge and treatment of disease, and to establish a natural law which should equal in character and results any other great established pathogenic law. Permit me, therefore, gentlemen, to offer you a very brief *resumé* of the contents of my book.

We know that in air which has been but once respired, carbonic acid subsists in the large proportion of from four to five per cent. Valentin esteems the amount of carbonic acid exhaled in twentyfour hours by the lungs and skin at thirty-three ounces and a fraction, representing say from nine to ten ounces of solid carbon, of which gross amount the skin exhales but a fiftieth or sixtieth part.

It has been demonstrated that when air already breathed in whole or in part is again respired, the lungs cease to act perfectly. According to Allen and Pepys, as well as others, in air that has been vitiated by successive respiration, and respired afresh, but a portion only of the residuary oxygen is replaced by carbonic acid gas. Air but once respired, however, is no

* London, Longmans, 1855.

longer fitted to sustain life, nay, it is productive of rapid death. The constant phenomenon in healthy living structures, to wit the absorption of oxygen and the elimination of carbonic acid, is interfered with. The carbon, consequently, is not excreted by the respiratory organs, and accumulates in the blood. What becomes of it, then. What becomes, I ask, of the effete carbon of which the system under the circumstances is no longer able to free itself, and for the expulsion of which neither the lungs nor any other excretory organ proves properly adequate.

While it is entirely devoid of organic structure, the composition of tubercle is essentially carbonaceous. I have, I conceive, determined after a course of investigation rigorously followed up during several years, that every case of phthisis, every case of scrofula, coming under my observation, had invariably, as antecedent, the prolonged habitual respiration of air already respired. This, I found, was the one, the only constant factor. For of all others hitherto alleged as the cause or causes of tubercle, none of them, singly, much more, collectively, applied to all the cases. I continually find, I affirm, how incessantly consumption is developed in man and animals exposed to an insufficiently renewed, prebreathed atmosphere. But, this result I do not find under any other conditions to which they might have been subjected, whatever.

Many authors, but especially Baudelocque and Fourcault, have insisted more or less forcibly on the influence which an insufficiently renewed atmosphere exercises over the production of phthisis and scrofula. But no one has as yet demonstrated, as I believe I have done, the mode in which not merely an unrenewed but a prerespired atmosphere acts, and no one hitherto, I myself excepted, has appreciated its real importance and determined its injurious influences. I would resume, then, my conviction in the following proposition. Owing to the imperfect performance of the respiratory function, caused by the prolonged inhalation of a prebreathed atmosphere, an atmosphere defrauded of its just proportion of unfouled oxygen, an atmosphere further loaded with metamorphic waste and offensive moisture, the excretion of the effete carbon becomes incomplete, consequently accumulates in the blood, and is

deposited under the designation of tubercle in the different portions of the living organism.

If, indeed, there be predisposing causes in respect of the production of tubercle, they merely perform an indirect part, a part in conjunction with the proximate and principal cause, the respiration, to wit, of prebreathed air. Aside from this, from the habitual respiration of a prerespired atmosphere, the production of tubercle, I assert, is wholly impossible. When the lower animals, themselves, are subjected to the respiration of air that has been prerespired, but are otherwise well supplied with food, light, and warmth, they, too, contract tubercle, as man himself under like circumstances contracts it. While, on the other hand, animals, however ill fed and treated, but otherwise respiring air not fouled, not prebreathed, remain invariably exempt from tubercle.

The continued respiration of an atmosphere loaded with animal excretions, such as air more or less already respired, gradually induces a morbid alteration in the blood. This prevents the due combustion and excretion of the metamorphic carbon, further taints the blood. Thus, then, the dead molecules, continually passing through the organism, in other words the effete carbon, morphologically transformed into tubercle, accumulate in the organism, and unable to escape by the lungs, and finding no other outlet, are deposited, perforce, throughout the economy.

If this doctrine be well founded, as I submit that it is, it is easy to forsee the revolution which it is calculated to effect in the treatment, but more especially in the prevention, of a class of diseases hitherto so calamitously and irreversibly fatal. It would result from it that tubercle might in all cases be prevented, and, taken early, very often removed, in short, *in posse* as *in esse*, that the malady termed consumption might one day become unknown.

I, therefore, submit my claim as the discoverer of the true cause of tubercle, and of the only rational mode of treatment, that is to say treatment based on a complete knowledge and suppression of the cause, to the courteous consideration and impartial judgment of the Academy, and subscribe myself,

with every sentiment of respect and consideration, Gentlemen, your obedient, humble servant,

HENRY MACCORMAC.

Up to the date of the publication of my treatise on Phthisis and Scrofula, in 1855, indeed, referred for consideration by the Academy to M.M. Barth and Cloquet,* there had subsisted no tenable theory, whatever, as to the actual formation and proper treatment of tubercle. It was affirmed, for example, that it was altered albumen, about as much as to say that x is equal to x, or simply nothing. If the theory which I propound be a sound theory, as I contend it is, this theory must necessarily stand. It alone suffices to explain, satisfactorily, each and all of the phenomena of intercurrent tubercle, alone identifies them with those of consumption and scrofula, and brings under one and the same category not only these diseases, but *tabes mesenterica* or tubercular peritonitis, Potts disease of the spine otherwise tubercle of the bodies of the vertebrae, white swelling or tubercular synovitis, water on the brain or tubercular arachnitis, and quite a number of differently named diseases, although substantially the same, according to the parts in which the tubercles had been deposited, and the aspects which the maladies which they induce assume. The fact is, the absurd and for the most part meaningless names of scrofula, Kings evil, decline, white swelling, consumption, water on the brain, and the like, were imposed in the infancy of pathology, and when diseases, in utter ignorance of their causes, were named after one or more prominent symptoms.

Living rooms, and especially bedrooms, too generally, abound with carbonic acid and the various foulnesses of respiration, to an extent quite incompatible with sound health, and, there-

* ACADEMIE IMPERIALE ET MEDECINE A PARIS.—SEANCE DU 4 MAI, 1858.—M. Velpeau dépose sur le bureau un travail de M. MacCormac, *sur le traitment, la nature et la prophylaxie de la phthisie pulmonaire, et, incidemment, de la scrofule.* Selon M. Mac Cormac, la cause matérielle de la phthisie serait l'accumulation du carbone dans le sang. L'auteur rapporte des expériences faites sur un certain nombre de chiens, dont la moitié fut laissée á l'air libre et dont l'autre fut renfermée dans un air chargé de carbone. Ces derniers devinrent tous phthisiques en six semaines. L'ouvrage de M. Mac Cormac est en anglais et renvoyé à l'examen de MM. Barth et Cloquet. *L'Union Médicale*, 6 Mai, 1858.

fore, entailing, more or less slowly, more or less quickly, the production of tubercle. But, when indolence and sedentary pursuits or overwhelming necessity, however, induces the occupation of such rooms night and day, and always, as is so much the case with tailors, seamstresses, bakers, clerks, soldiers, artists, mechanics, students, and others, tubercle, especially if there be overcrowding, is the inevitable and disastrously rapid result.

When air containing two per cent, nay, half a per cent, of carbonic acid, as accruing from respiration, is habitually breathed, the blood ceases, in part, to eliminate its tissue waste, oxygen is not absorbed, or absorbed enough, and, consequently, the metamorphic carbon waste is not oxidised or oxidised, adequately. The products of the interstitial waste, incessantly going on, are retained, therefore, in the blood. The waste is converted into tubercle. It is tubercle. And tubercle is the dead waste retained in the system laid down, here and there, throughout the living tissues, owing to the impossibility of otherwise getting rid of it, so long as air previously respired is habitually made use of. All this is open to demonstration by any one who will take the pains to observe. The results, unhappily, may be witnessed going on to any extent around. It is a law of degradation, a law of destruction, which, under the circumstances I have named, extends to all living things.

The composition of tubercle, in fact, is identical with the tissue waste which it represents, and along with some occasional adventitious earthy matters, the same as the carbonaceous and watery excreta from the lungs themselves. No single trace of vital organic structure in tubercle is, in truth, discernible. The same was affirmed by M. Robin to my son in Paris. That this is so, indeed, is now matter of notoriety to most observers. During the long years in which I have conducted this inquiry, I have not known a single instance of phthisis or scrofula that was not preceded and attended by the habitual respiration of air more or less prebreathed. From and after July 1, 1856, I took down, verbally or in writing, from the mouths of sufferers, the particulars of a thousand consecutive cases of confirmed

phthisis, and in no single case did I find it otherwise. Among the poorer patients I registered, as I register still, repeated instances of four, five, and even six persons, all sleeping habitually together in one and the same apartment, with closed doors and windows. These were the cases of persons who came to me for advice, and do not include cases of phthisis which I saw from home, and the multitudinous instances of ordinary scrofula. The rich, surrounded with every comfort, are seized equally with the poor, when the air they consume is not adequately replaced. Poor servant girls, put to sleep in garrets, holes, corners, recesses, where the air is ill renewed, are incessant victims of tubercle. Tubercle, in fact, is the representative of the unconsumed interstitial waste, the carbonaceous metamorphic matters, which, owing to an irrespirable rebreathed atmosphere, fails to be discharged from the blood. This conclusion is the one thing needful to complete our knowledge of tubercle, and to reconcile its production with the previously known phenomena of the organism. It is the great, the profound induction, namely, that rebreathed air alone induces tubercle, thus placing it within our power, by turning that induction to account, to supersede consumption and scrofula for ever. The two great classes of animals, the vegetable eaters and the flesh eaters, alike, consume virtually the same nonrishment, under different forms, and are subject mainly to the same physiological and pathological laws.* Fat is not, as has been imagined, the one respiratory material. Albumen, gelatin, fibrin, but only when converted into effete tissue, are consumed and burnt off,† The metamorphic waste or worn out materials of the frame, only, go off by the kidneys and lungs. For food, as food, is never oxidised. In short, the kidney educts, to wit, urea and the phosphates, coupled with carbonic acid and water, the two last passing of by the lungs, are the final results of the combustion of the material after the tissues have been formed and expended.‡

* Die grasetende Dieren gebruiken dus sortgelijk voedzel als de vleschetende. Zy gebruiken beiden eiwitstoffe. Mulder, *Archief*, Leyden 1838.

† Also ist nicht bloss Fett ein Athemmittel, sondern ebenso das Eiweiss. Moleschott, *Kreislauf des Lebens*, p. 124, 231.

‡ Durch Verbindung mit Sauerstoff zerfallen alle diese Stoffe in Harnstoff und Kohlensäure, die Fette in Kohlensäure und Wasser. Harnstoff, Kohlensäure, und

That the animals in our menageries, the cows in the close cowhouses of London and Paris suffer, while those in the open pastures escape, is well known. It would be difficult to imagine a more important aid in illustration, however, than that which I find to hand, in the Report of the Commissioners appointed to inquire into the health of the army.* It was as if a gigantic experiment, so far as concerns the evil operation of rebreathed air, had been expressly instituted in corroboration of the views which I here maintain. The annual mortality in Manchester, one of the most unhealthy of English towns, among the male civil population of the same ages as the soldier, it seems, is 12·4 per thousand, whereas, among the Foot Guards it is actually 20·4, the annual average mortality among the general male population being about 9·2.† It thus appears that if the army, at home, picked men be it observed, were but as healthy as is the population from which they are drawn, our soldiers would die at one half the rate, only, which they now do,‡ and, yet, let us imagine, owing to the practice of invaliding, the entire army mortality from tubercular disease, is really not shown. The mortality in the Guards, then, is three and one half times greater than it is among agricultural labourers generally. It is more than twice as great as among the night police, nearly twice as great even as among miners and clerks whose occupation, from their stooping attitude, and want of outdoor exercise, along with prebreathed night air, is singularly unhealthy. It results, therefore, owing to insufficient exercise in the open air, the absence of adequate ventilation, and before, and above all, the respiration of prebreathed air, that while the deaths, from pulmonary disease, in civil life at the soldiers ages are 6·3 per thousand, among the Foot Guards they amount, or amounted, to no less than 20·4 per thousand. In fact, of the entire deaths, from all causes, the deaths from diseases in the lungs, in the Guards, rose to 67·6 per cent.

Wasser die Enderzeugnesse des thierischen Lebens sie sind die höchsten Verbrennungstufen, welche der Stoff ersteigt, nachdem er die Gewebe Knochen, Knorpel Lungen und Häute, also gebildet hat. Moleschott, *Kreislauf des Lebens*, S. 220.

* This *Report*, London 1858, my son, Dr. William MacCormac, has very fully commented upon in *L'Union Medicale*.

† *Report*, p. 7.

‡ *Id.* p. 8.

Sergeant Brown states that he could not bear the air, so dreadfully offensive was it, in the morning, in the soldiers rooms, the particulars, indeed, hardly bear repetition, until the windows had been for some time opened. In short, to employ the language of the report, the fetid unwholesome atmosphere in which the soldier sleeps, and which he habitually breathes, probably, nay most certainly it does so, lays the seeds of that pulmonary disease which is so fatal in the British army. Thus, then, in England the disgraceful anomaly subsists of adult men, men elected for their general vigour and robustness, dying faster than does the general population with all its vast liabilities of infancy infirmity and disease. It is just as if fortytwo thousand persons, the deaths in excess, from 1839 to 1853, were thrown into the sea, fusilladed, or poisoned, wholesale. The soldier has been debarred of pure night air. Closed windows and the consequent vicious hematosis do the rest. Can there, in truth, be a doubt that the extreme prevalence of phthisis not only among the English, but among French German Belgian and Russian soldiers, must be ascribed, as the Sanitary Commissioners in respect of the English army in their Report ascribed it, to the vitiated overcrowded atmosphere of the barrack room.*

The evidence furnished by Baudelocque in his book,† as to the production of scrofula, and by Fourcault in his treatise,‡ as to the production of consumption, from the respiration of foul air, is extensive as it is conclusive. It is time, indeed, to look upon phthisis and scrofula, water on the brain, and mesenteric consumption, as diseases springing from one source, tubercle to wit, and to consider tubercle, itself, as the unconsumed metamorphic waste, not consumed and not eliminated or possible to eliminate, in full, so long as air rebreathed is the only or the principal pabulum of life.

Everything that lowers the organism, that impairs the ability to undergo healthy effort in the open air, impairs, likewise, the capacity of the chest and lungs, acts as a predisposing source of tubercle, tends in short to render more fatal and continuous

* Parkes, *Manual of Practical Hygiene.* Lond. 1864, p. 91.
† *Etudes sur la Maladie Scrophuleuse.*
‡ *Causes Générales des Maladies Chroniques.*

the operation of the one and only source of tuberculous deposit, the habitual respiration, namely, of an already breathed atmosphere. We have seen the picked men of the English, Irish, and Scottish people, as composing the British army, men in the flower of their years, men of strength and stamina, stalwart stately men, dying off twice as fast, three times as fast, probably, if invalids be included, as does the community, at large, not exposed, at least to the same extent, to the same deteriorating influences, in short not breathing air equally rebreathed. The lions, tigers, and apes of the menageries contract tubercle, just as readily indeed as did the animals which were the subjects of my own experiments. Rabbits, well supplied with food and warmth, were shut up in barrels and boxes, with a scanty air supply, which they consumed within certain limits, again and again, just as the poor soldiers did, and with like disastrous results. Whereas, the rabbits that were left at large, retained their health indefinitely. It is an experiment open to any one to repeat. A few boards nailed together, an old barrel, a box, any circumscribed enclosure, in fine, will suffice, just as did the wooden enclosures in which French shepherds pass unwholesome nights, and those in which New Zealanders, travestying civilisation, stew themselves to death. Such experiments illustrate the morbid degeneration which living creatures ever undergo when forced habitually to respire air already breathed. Thus it was with the little animals in which Dr. Baron induced tubercles, under confinement, though he ascribed them to the food. Of these tubercles he has given coloured plates in the quarto volume in which his views are detailed. The majority of rabbits, reared in barrels, almost all the cows in Paris, even the birds in aviaries, labour under tubercle.* From the smallest to the greatest, from the feeblest to the strongest, all air breathing animals and man, very especially, owing to his great indoor seclusion and close sleeping rooms, are subject to the law of tubercle formation. In other words, after a certain lapse of time, when confined, or mainly confined to an

* La plupart des lapins qu'on élève dans des tonneaux ont des tubercules, presque toutes les vaches des nourisseurs de Paris meurent phthisiques, et il n'est pas jusqu' aux oiseaux de volière qui n'en eprouvent les mêmes effets morbides.—*Roche, Art. Phthisie, Dict. de Med, et Chir. Prat.*

ill renewed, previously respired atmosphere, they suffer invariably from tubercle. Truly, the breath of man, as Rousseau says, is fatal to his kind.*

I have combated the various objections made to my views in the course of this work. I was referred, for example, by a writer in the *Westminster Review*,† doubtless, some medical man, to Schleisners work on Iceland, wherein, according to the reviewer, it was affirmed that in Iceland consumption did not subsist. In the case of a law, however, in respect of the inevitable sequence of tubercle on rebreathed air, to which as I assert, the living economy of every breathing creature, is subject, the people of Iceland, the conditions being otherwise the same, cannot prove an exception. On reference, indeed, to Schleisners work,‡ I found that, although the inhabitants have the pretention to be exempt not only from consumption, but from diseases of the heart rheumatism and certain other maladies, they are, in effect, as is repeatedly shown by Schleisner himself, liable to both scrofula and phthisis, the latter more or less frequently combined with cysticerci, termed hydatids by Schleisner, in the lungs. At page thirtyseven, for example, there is a table of the maladies principally fatal,§ in the course of ten years, or from 1827 to 1837. Of *Brystsyge* or phthisis, I find eleven hundred and sixtyseven cases, and of *Taerende Syge* or decline, three hundred and seventyseven cases. This latter expression, though in fact synonymous with the other, is, however, obscure. In another table, embracing a quinquennial period, or from 1840 to 1844, in which the mortality from phthisis in Copenhagen is contrasted with that in Iceland, I find the mortality in Copenhagen so high as 13·2 per cent, whereas in Iceland it was, indeed, only 7·8 per cent. This, however, only proves the so much greater prevalence of indoor, sedentary life in one country than in the other, but does not justify the reviewer, who makes no textual reference to Schleisner, and could not well, in fact, have read the work, in his assertion that consumption does not prevail in Iceland.

* L'haleine de l'homme, est mortelle à ses semblables.

† October 1856.

‡ *Island undersögt fra et laegevidenskabeligt Synspunkt.* Kjöbenhavn 1849, p. 3.

§ *Hyppigste Dödsaarsager i et Land.*

Indeed, observes Schleisner, there is a considerable amount of scrofula and incurable cases in Iceland.* He then adds, in the same page, not to mention other references. Of consumption and decline, of which certainly the majority have suffered from hydatids, 10·3 per cent perish in Iceland, whereas, in Kopenhagen 18·2 per cent.† This last we see is higher than the average in England, and even more than in our Guards.

It has been affirmed by some that phthisis will not take place at certain elevations. Tubercle, however, will ensue at any elevation, and in any climate, wherever, in fine, brick or stone or glass or wooden impediments prevent the pure unprebreathed air of heaven from reaching the lungs of man or brute.

It was also further asserted that the Esquimaux and other inhabitants of northern regions, were likewise exempt from phthisis and scrofula. From Mr. Simpson, however, surgeon to the Plover, and who actually lived four years in the polar regions, I obtained, as is elsewhere shown, the most striking contradiction to this most untrue averment. Like causes, indeed, produce like results whether among Esquimaux, Danes, and Icelanders, as among the people of more southern lands. I nowhere find exceptions, not in Russia certainly, where, in winter, at least, there is of course much indoor life, and where scrofula, not to dwell on phthisis, prevails to a truly virulent extent.

Irrational modes of treatment, medicated inhalations, a graduated temperature, iodine, prussic acid, phosphatic salts, cod liver oil, and the rest, must be replaced by a pure, unprebreathed atmosphere, day and night, and always, a more active out of door life, bodily effort, warm clothing, good meat and good wine, malt liquors, quinine when required, and the preparations of iron. Tuberculization, whether of the lungs, mesentery, glands, joints, bones, and brain, in short, tubercle in any part of the body, so long as pure unprebreathed air

* *Paa Island findes et meget stort Antal af Kröblinge og chroniske uhelbredelige Patienter.* p. 40.

† *Af Brystsyge og taerende Syge, hvoraf imidlertid vistnok de Fleste have vaeret bortrevne of Hydatidesygdommen, döer der paa Island* 10·3 *p. ct., i Kjöbenhavn derimod* 18·2 *p. ct.*

should be respired, would become simply an impossible thing. Very often, too, phthisis might be cured. One reason, the reason, indeed, why so few do in fact recover, is entirely because the cause which produces the disease, the respiration again and again, namely, of the same unrenewed air, remains in operation during the continuance of the malady, and, while it prevents the possible absorption of tubercles, already formed, actually causes the deposition of fresh ones, so that the victim is left with hardly a chance of recovery.

M. D., for example, came to me, the summer before last, in a very despondent state, labouring under cough, night sweats, emaciation, in short, the usual train of symptomatic suffering, the signs rational and physical, attendant on advanced tubercular deposits. He brought me his expectoration in a glass vessel. It consisted of muco purulent matters, intermingled with small tuberculous masses. He had slept in a low ceilinged room with wife and child, bed curtains and window curtains alike closed, and was also much confined during the day. After some time I induced him to come and reside by the shore of the sea, to keep the upper portion of his window widely open at night, so that the air in his sleeping chamber should be pure, unprerespired, as on the adjoining grass or on the sea wave. During the day he was directed, sufficiently clothed, to live, habitually, in fact constantly out of doors, as well as to to eat and drink generously. Steel and other tonics were exhibited, freely, and his mind was as much as possible tranquillized. After a summer of this treatment M. D. was able to attend afresh to business. He had almost entirely regained his pristine vigour and robustness, along with the cheerfulness which characterised him before his indisposition. I could recite several other similar cases, some among the rich, others among the poor. I shall only, however, advert to the instance of a boy in humble life, with all the usual features of phthisis, hemoptysis, inclusive. On going to see the lad, I found him lying in bed in a small room on the ground floor. His parents had but imperfectly followed out the directions of my son, under whose care he had for some time been, for they had opened the lower, instead of the upper

portion of the window. His pulse was one hundred and twenty beats per minute, the night sweats were profuse, his strength was utterly gone. The emaciation and weakness, in short, were extreme. Every feature, in truth, of confirmed phthisis was there. I prescribed a drachm of the tartrate of iron in four ounces of wine, a dessert spoonful three times daily, milk with a small proportion of spirits, beaten up eggs and wine, oysters, curd, in short, whatever food it was possible for him to take, or for his solicitously willing parents to procure. At my next visit I found that the upper portion of the window had, indeed, been opened, but at the same time that it was carefully veiled by a blind. This blind was at once removed so as to insure the freest possible admission of air, day and night and always, into the room. He continued, with various alternations, in a very weak state, but yet slowly mending, until, towards the spring, when I directed him, warmly wrapped up in blankets, to be carried out of doors, daily, and to sit at the fire. About a month or more had passed, when an erect lad, in comparative flesh and strength, walked up to see me, accompanied by his mother, not entirely well, indeed, but with stamina vastly roused and bettered, and every promise of final recovery. I have seen him often, since, and he is, now, as free from phthisis as it is possible for any one to be.

When scrofula is not attended with pulmonary tuberculization, the prospect of amendment is proportionably enhanced. The treatment which I recommend is mainly the same as in phthisis, but the results, perhaps, are more immediate, and the instances of amendment, at any rate, organs less vital being implicated, are, with proper management, proportionably greater.

The only rational treatment of tuberculous deposits, at once curative and preventative, may be carried out, everywhere, and by every practitioner. Wherever tubercle occurs, there, it may be dealt with. To render treatment, however, truly available, on the large scale required by the frequency and exigency of the disease, the cooperation of the medical profession and of the public, as in the case of cowpox, itself, will be requisite, otherwise preventative or curative measures will not be intelligently and efficiently carried out. The excessive

prevalence and destructiveness attendant on the different forms of tubercle, strongly incite to the immediate adoption of a mode of treatment calculated, as I have shown, not only to relieve but to prevent the disease. No single instance, I contend, of consumption could or would take place among our troops, or in the community at large, if the window spaces were left widely open, by night, taking care that individuals did not sleep with covered heads, so as to insure the most complete and incessant renewal of the atmosphere. Thus, with exercise in the open air, by day, coupled with its respiration by night, ample nourishment and warm habiliments, otherwise, the mortality from phthisis would, I am convinced as of my life and being, prove eventually *nil*.

ON THE TRUE NATURE AND ABSOLUTE PREVENTIBILITY OF TUBERCULAR CONSUMPTION.

Read before the London Medico Chirurgical Society, April 23, 1861.

The statements I am about to make are momentous, indeed, since they involve the question of the extirpation of consumption and scrofula from the world. And, yet, these statements are founded on laws of the organism, laws old as creation, laws coeval with the existence of living kind. We all know the difficulties encountered by the first promulgators of facts now deemed intelligible enough to be taught in schools for the young. We sympathise with the trials of Kepler, Galileo, Servetus, Harvey, Jenner, in fine, almost every inquirer in his turn. Yet, mans soul is so constituted as to take in every truth when that truth shall be presented to it with sufficient firmness and insistency. Certainly, if there be any truth that needs insisting on, it is that a ceaselessly renewed, unprebreathed atmosphere is essential to the living organism, that the bloods purity stands in closest relation to it, and that consumption and scrofula, since they result from neglect of the physical laws of our corporeal being, are entirely preventible diseases.

Again and again, and in the clearest terms, I have stated that tubercle is no other than the effete unconsumed carbonaceous waste, in short, effete matter retained unoxidised within the living organism by reason of the habitual respiration of an unrenewed prebreathed atmosphere. The organic life reposes on a ceaseless movement of composition and decomposition, of integration and disintegration, the matters assimilated, yesterday, being thrust aside and replaced by the new materials to day. This alternate movement, this tissue metamorphosis, the *Stoffwechsel* of the Germans, is founded on incessant food

and air supplies. When the same air is respired oftener than once, the waste is not consumed, and the effete matters are not adequately got rid of, but are deposited in the living tissues. This must be so, for the metamorphic carbon is only exhaled on condition that the inspired atmosphere shall be an unprebreathed atmosphere. The demand of the economy for a renewed atmosphere, to replace that which by reason of the processes of respiration has become impure, is only less urgent than the demand for food. But zoochemical processes must be assumed more or less by the intelligence, else they cannot be apprehended at all.

I am not the first to proclaim the advantages of fresh air, but I am the very first to assert the efficacy of unprebreathed air, the first to proclaim that phthisis is the result of the unoxidised carbonaceous materials accumulating in the blood, and their deposit as the structureless, amorphous substance, hitherto known under the designation of tubercle. The irritation arising from the presence of this virtually foreign body in the living organism, induces hectic, wasting, and, lastly, death. Were a pure unprebreathed atmosphere respired incessantly, the effete tissues would be as incessantly oxidised. There could, then, be no tubercle, nor any of the diseases which tubercle induces. Tubercle so named, indeed, does not present a trace of organisation. There are no cells, no vessels, no nerves, unless when these are accidentally, or, as it were, mechanically, involved. Amorphous it is, and structureless, not the vital result of a vital process, but the negation of vitality. It consists of hydrocarbonaceous and sometimes other waste, insufficiently burnt off, so far as the carbon is concerned, by reason of respiring a previously breathed imperfectly renewed atmosphere. For, otherwise, no toxic agent, no impurity, even, however otherwise it may assail life, will, as such, conduct to tubercle. Nay, if oxygen but abound, the egesta will be burnt off in the very midst of stench and putrefaction. Whereas, if adequate oxygen do not abound, purity the most exquisite, along with all the spices and perfumes of Araby, will not else avert or arrest the ruin of the organism. If the air respired have not been respired, before, there is, there will be, there can

be, no tubercle. But if the air habitually respired have been respired, before, the blood remains fouled, and tubercle becomes inevitable.

The intelligent study of nature reveals unity and congruity in all its parts. Nothing is absent, nothing is left imperfect in the stupendous whole. The skill and prevision of the mighty Artificer are conspicuous in the least, as in the greatest of his works. It would be, indeed, strange were it otherwise in the so admirably perfect organism of man and brute. There is, I repeat, a perfect correspondence between waste and supply, adaptation and result, in the different acts of the economy. The waste increases, *pari passu*, with the work. In the peer as in the peasant, the savage as the civilised man, alike, exclusive of three or four or five pounds of liquid ingesta and egesta, there are, there must be, the daily two or three pounds, of solid varied ingesta, the two or more pounds of interstitial daily waste. If, now, we divide the average daily solid, to say nothing of the fluid sustenance, less two or three ounces for intestinal dejections, into the entire mass of the living frame, we shall perceive how rapidly conversion and interchange must ensue. A very few months shall, perhaps, suffice to replace each several molecule of the organism. The food is assimilated, converted into living tissue, which then dies, or in other words is disintegrated, in fine, oxidised, and passes off as dead, effete tissue, through the medium of the various excretory outlets. The amount of metamorphic waste, both absolute and relative, keeping in view climate season fasting repletion sleeping waking temperature stature effort sex position age, varies with the wants and requirements of the economy. The process is a ceaseless one, until, the springs of life wearing out, the metamorphosis of tissue comes to a close and the workings of the organism, itself, stand still. For life, so to speak, is no other than an incessant assimilation and taking asunder, and death, organically speaking, is but the cessation of both.

An ill renewed, but above all prebreathed indoor atmosphere, coupled with inactive habits and muscular inertia, particularly of the upper extremities and respiratory apparatus, is the all potent source of phthisis and scrofula, as an atmo-

sphere incessantly renewed, unprebreathed, with adequate muscular respiratory effort, is the sure and certain preventitive of both. The living organism needs air and action. A stagnant prebreathed atmosphere, with closed room spaces, muscular torpor and excessive indoor life, brings inevitably along with it tubercular deposits, physical perdition, and decay. Chamber life, indeed, together with a frequently respired atmosphere of stagnant respiratory impurities, is as certainly provocative of tubercle as that fire burns or water flows. Cellars garrets airless room spaces, indoor instead of outdoor life, prebreathed instead of unprebreathed air, be the scene otherwise a palace or a hovel, entail inevitable tubercle in one or other of its protean forms. The ill aired mine and dreary dwelling, as abounding with ceaseless impurities, are, as thus, on a par in respect of the production of phthisis and scrofula. For air, pure air, is lifes great essential, and, coupled with food, the very foundation of our organic being. Nay, the organism, in a sense, is air made flesh, and a changeless stagnant prerespired chamber atmosphere, loaded with matters effete and dead, impairs the vital processes, clogs the blood, renders it impure. From four to five per cent carbonic acid gas issues with every breath, exhaled, until the respired atmosphere become unfitted utterly for the renovation and purification of the blood. But air far less fouled than this, coupled with seclusion and inaction, also proves deleterious. The inevitable final issue of this continued stasis of the metamorphic carbonaceous waste, is its deposit as tubercle in the various tissues.

Atmospheric oxygen, sufficiently respired, depurates the blood. At every hearts beat, each breath we draw, the effete matters combine with oxygen, and, being oxidised, are expelled. I had long, indeed, come to the conclusion that absent ventilation, defective insolation, inadequate effort, induced phthisis. But why they did so, neither I nor any one could point out, until I arrived at the happy inference that the arrest or invasion of the natural order of the metamorphic changes, because of rebreathed air, hindering or suspending, first, the oxidation, then, the expulsion of the effete carbonaceous waste, was in reality the direct and only origin of tubercle. For

tubercle deposits are no other than the effete carbon not oxidised, not consumed, and, therefore, not expelled. In effect, the effete metamorphic tissue and tubercle are one. Every fact in pathology proves it, every process in our organism but lends fresh force to a conclusion, which, if only acted upon, would release our fellows from a hitherto ravening and relentless scourge.

Both skin and lungs, the latter especially, need ceaseless ventilation, and that beneath the free heavens, or with immediate access to them. For, as the living flame of a candle or taper expires when supplied with air but once respired, so is the flame of lifes lamp, itself, extinguished when air that has been respired, before, is respired again. We should, therefore, suffer our young people, our dependents, to go out freely, to brave wind and rain, and storm and cold, lest they incur the dread alternative of delayed or perverted tissue metamorphosis, imperfect oxidation, in fine, the deposit of the carbonaceous waste, within, instead of without the organism. For, the systemic waste cannot be retained without the certain risk of blood contamination and tubercular decay. Vicarious exercise at the expense of other animals, good enough in its way, will not entirely suffice for the elimination of the metamorphic waste, will not supersede the necessity of direct action of our own. Any economy of the time and effort requisite to secure the needful tissue metamorphosis, the oxidation and elimination of the carbonaceous and other waste, is a pernicious economy, proves the easy stepping stone to disease and death. When the effete carbon is thoroughly burnt off and discharged, there is health. Consumption in any of its forms, tubercle in any of its forms, is impossible. But when the effete carbon is not burnt off and not discharged, consumption is not only possible, but inevitable.

Like laws, modified in their operation by circumstances, govern the economy from the equator to the poles. Everywhere there is tissue metamorphosis, everywhere oxidation, more or less complete, of the effete carbonaceous waste. Everywhere the effete matters are expelled, or, failing expulsion, we incur the inevitable alternative of disease and death.

In one region as in another, the various food equivalents, are consumed daily, in order to maintain the forces of the organism. It is a tale about people needing less food at the equator. It is a legend as to their requiring more at the poles. There is no such thing as respiratory food *per se*, or plastic food *per se*. The ordinary food supplies contain the various matters, the carbon hydrogen nitrogen and oxygen, the iron phosphorus magnesia sulphur lime potash soda needed by the economy. It is not food, as food, which is oxidised, but the disintegrated tissue, only, in fine the metamorphic waste, no longer food, but effete matter only. The excesses of starving savages, in respect of blubber and train oil, are no more the criterion of normal wants, than are the excesses of our gluttons and drunkards at home the *norma* of civilized life. The needs of the economy, keeping in view the amount of effort and of waste, are indeed mainly alike in every clime. I found it so among the American Indians. I determined it alike in the natives of Africa. An amiable fanatic, called Cornaro, once, it appears, asserted that twelve ounces of solid food, daily, sufficed for the food of man. If so, it was a great misstatement.

There is, in truth, in respect of animal wants, a narrow margin, beyond or short of which we cannot safely go. A reasonable food sufficiency, with abundant air supplies, muscular effort, and strict cleanliness, are needed for the pleasant discharge of the processes of life. Habitual excess, by embarrassing the economy, and habitual deficiency, as failing in the requisite material supplies, lead, severally, though in different ways, to disease and death. The food supply is metamorphosed into living tissue. The living tissue, its work discharged, is converted into effete or dead tissue, which, through the intervention of the various emunctories, is or ought to be forthwith expelled. But if the effete or dead tissue, so far as regards the lung function, be not oxidised, be not expelled, the blood remains loaded, and the effete tissue, finding no adequate outlet, is laid down as tubercle throughout the organism, completing thus, intelligibly, the cycle of sufficient healthy, or, otherwise, of insufficient unhealthy action, within the organism.

The hypotheses suborned to explain the occurrence of tubercle on any other supposition than that of the deposit of the unconsumed carbonaceous waste, are chaotic, indeed, serve but to illustrate the extravagance of thought and the recklessness of speculation. Thus, tubercles have been ascribed to cold, though cold without foul air cannot possibly induce tubercle. The inconsequence of referring them to inflammation, is shown in the concurrence of tubercles in, perhaps, half a dozen different organs that never were subjected to inflammation at any time. The worst food supplies, if only there be unprebreathed air, will not induce tubercle. Nor will the best avail to prevent it, should unprebreathed air be wanting. Damp, *per se*, never engendered tubercle at any time. As to hereditary influences, so named, they are simply *nil*. Phthisical persons, even, will not have phthisical children, unless these children be debarred from pure air. Nay, the phthisical, themselves, will escape all further tubercle deposit if only they respire unprebreathed air. For there cannot be tubercle without the inclusion of effete tissue, and this, there cannot be so long as there is no prerespired air. If the effete carbonaceous tissue be only duly oxidised, tubercle deposits are impossible. Every act of healthy respiration deprives a portion of air of its oxygen, gets rid of the effete carbonaceous waste. But if the air prove deficient in oxygen, if it be only saturated with the products of respiration, the oxidation will not be a healthy or sufficient oxidation, and no power on earth shall long avert the deposition of tubercle.

Living creatures, man or brute, plunged habitually in an atmosphere polluted by incessant respiration, become tubercle stricken, accordingly. In vain the metamorphic waste is daily poured into the blood. Unless it be sufficiently oxidised and expelled it is converted into tubercle. There is here no possible alternative. For tubercle, as I must incessantly repeat, is nothing else than the unoxidised carbonaceous waste. The Scilly Islanders, with the air of the great ocean at their doors, exclude it with all imaginable care, and die off, tubercle stricken, accordingly. But, like facts abound every where among the perishing multitude, devoured, so to speak, with

consumption and scrofula, owing to their utter neglect and misappreciation of the laws and obligations of organic life. The Icelanders and Esquimaux, as I have shown, are not exempt from phthisis and scrofula, simply because they do not shun a twice respired and tainted atmosphere. Comfortable, respectable England, Scotland, and Ireland, reposing in ceiled rooms with closed doors and windows, are infested with consumption and scrofula, while the dwellers in the Hebrides and north western Scottish coasts, living and sleeping in unceiled hovels, with a hole in the roof for chimney and window, a fire on the middle of the floor maintaining day and night a ceaseless upward current of pure unprebreathed air, are absolutely unvisited by both. No where is there witnessed among them the most ruinous and devastating of all scourges, no hideous scrofula, that most grievous and filthy disease, as it is truly named in the ritual of the Kings touch in the time of Henry VII., no wasting decline, no hip joint disease, no tubercle of the mesentery, no scrofulous caries of the spine, no white swelling of the knee, no gorged parotids, no water in the brain ventricles. Never was there afforded a more striking confirmation of doctrines, than what this immunity of the people of the Hebrides and north west Scottish coasts affords to mine, an immunity to which, with all our refinement culture and intelligence, we have hitherto been utterly unable to attain. If physiology and pathology, if our practical and speculative inquirers, will not recognise in their entirety the facts and inferences which I present to them, why, then, so much the worse for physiology and pathology, so much the worse for these practical and speculative inquirers, but above all, so much the worse for the helpless multitude committed, in respect of measures curative and preventative, to their care.

We cannot with safety ignore the exigencies of our organism. We must all learn the meaning of tissue metamorphosis, the vital truths of physiology. Nature employs every means to get rid of the effete waste, to renew the tainted atmosphere. Why do we not hearken to her monitory voices. The expired and heated air, if only suffered to do so at once, rises and is lost in space never to return. But where there is no adequate

outlet for the lung dejections, no sufficient indraught of an unprebreathed atmosphere, natures providence is frustrated, her prevision is in vain.

Pathology and physiology, human and comparative, rightly understood, confirm the positions I have laid down. If any one object, it is surely open to him to point out the possible other source of tubercle, when the carbonaceous waste, failing oxidation, is retained in the organism. The *instantia crucis* is the easiest in the world. It is only necessary to shut up some living, breathing creature, keeping it else clean and dry and well fed, but otherwise constrained to respire anew the same vitiated prebreathed atmosphere, in order, with the unfailing sequence of cause and effect, to induce tubercle deposits in the framework of the economy. There is not a single organ which is not the possible haunt of tubercle. When tubercle, indeed, disintegrates the pulmonary vessels, we have the hemoptysis of the pathologist, the burst blood vessel of the people. But when tubercle assails the lung tissue, we have the phthisis of pathologists, the decline of the vulgar, the scourge of the world. There is, in truth, but one common origin, one common pathology, for tubercle in whatever guise. Phthisis and scrofula result when the blood is loaded with the effete matters which a prebreathed atmosphere renders it impossible to expel.

It was once supposed that the ravages of consumption affected England in especial. It is not so. They affect every region where the same air is respired again and again, in short, wherever a pure fresh unprebreathed atmosphere is excluded from the living organism. Chambers wherein by reason of our unreflecting dread, we shut out the life inspiring element, the baleful habit of sleeping with closed doors and windows, and *à fortiori*, with the head covered so common in France as well as among our ignorant poor, generally, destroy more human beings than does fire or sword, nay, more than all other sources of preventible disease put together. How narrow, as contrasted with lung requirements, is the largest chamber, how restricted the allotted room space, how rapidly the air perishes, becomes saturated, so to speak, with respiratory impurities, poisonous and destructive utterly. Nay, the inferior animals, the cow

which expires seventy, the horse eighty ounces waste carbon during the night and day, when they share our perverted habits, incur the same dread natural retribution. The creatures in our zoological gardens, once insanely confined in heated air tight chambers, died off, tuberculous, but whenever unprebreathed air was supplied, their successors did well. Negroes and Creoles, when subjected, to the seclusion of colder regions, perish like the inhabitants of those regions. Phthisis and scrofula infest all Europe, the entire littoral of the Mediterranean. Yet, such is the might of prejudice, of folly, of ignorance, that a pure, fresh, unprebreathed atmosphere is by many looked upon with dread, instead of being regarded as the solace and safeguard of the world. Multitudes live and die in rooms curtailed of light and air. Some, who do not object to air by day, esteem it ruinous by night, exclude it with zealous care. Yet, if they but understood the needfulness of lung oxidation, the expulsion of effete waste, and the perilous facility with which the latter is deposited, they would haply run into an opposite extreme, and be as anxious to avail themselves of an unprebreathed unadulterated atmosphere, as they now are to reject it. Unhappily, the multitude sleep in dens, recesses, into which pure air rarely penetrates. Every strange and unnatural expedient is resorted to, in order to exclude the precious element from the panting, craving organism so anxious to drink it in. Nature employs expressest means to render respiration safe and profitable, we, means equally express to render it unsafe and unprofitable. We cannot respire an impure atmosphere without flying in the face of the divine economy. To children, in particular, in whom the tissue metamorphosis is so incessant, and who consume so much oxygen, the respiration of a pure unprebreathed atmosphere is among the most vital necessities of their corporeal being. What swarms of scrofula infested children and adults do we not incessantly encounter. How often have I removed the covering which besotted nurses and parents, unwitting what they did, threw over the poor infant in his cradle. How often too have I disengaged the head from the covering with which lunatics and others had invested it, trying as it were,

per force, to destroy the blood and consummate the ruin of the organism. Yes, the respiration of air, stagnant, prebreathed, foul, tends, of very necessity, to infirmity and death, whereas the respiration of a pure, sweet, unprebreathed atmosphere, by night and by day, induces health and cheerfulness, a brilliant eye and clear complexion, in fine, the sense as well as the reality of that physical wellbeing which attends compliance with natures expressest law.

Consumption and scrofula degrade and ruin the stamina of our race. They are the very bane of man. They afflict us on the earths surface. They follow us into the dreary mine. They spare nor age, nor rank, nor sex, nor class. The respiration of a previously respired atmosphere, is, I allege, the one single condition, the condition *sine qua non*, without which consumption or scrofula there cannot be. Even the offspring of the consumptive, provided only that they respire unprebreathed air, do not incur consumption, while persons the most vigorous, respiring incessantly the same atmosphere, cannot by possibility evade it. An imperfect hematosis, and consequent retention of the effete carbonaceous tissue, is the one and only source of tubercle. If the effete carbonaceous matters be not oxidised, they cannot leave the system, but must remain to taint the blood, and ravage the economy. The imperfect delivery of the effete waste entails tubercle. Tubercle itself is no other. Consumption and scrofula are as purely artificial as is poisoning by arsenic, and may be as securely set aside when we will. We have but to obey natures strict requirements, to supply our dwellings with air unprebreathed by night and by day. This is the very, the regal touch, the golden means which, would we only but adopt it, should accomplish what no royal touch ever yet did. The open casement comes to the rescue, with perfect certainty, neutralises the unholy virus that hurries so many to their doom, supplies, or ought to supply, a current pure unprebreathed as that which flows by the hill side or whispers on the grass lea. I shall never rest satisfied with less than a universal assent to these views. Day and daily clamour the voices of the victims of tubercle, vainly imploring the relief which has been denied them, hitherto, yet which it is within our amplest

power to impart when we will. There cannot be health unless we live in unison with natures harmonies, those divinest harmonies the violation of which alone induces an unparalleled scourge. Assuredly, the hour that witnesses the introduction of the measures for which I have so strenuously contended, the universal admission of air pure taintless unprebreathed, air just as it issues from the Creators hand, shall also witness the disappearance, for ever, of consumption and scrofula, with all their hideous train.

ADDRESS TO THE MEDICAL AND PATHOLOGICAL SOCIETY OF ULSTER.

Read, Belfast, June 5, 1861.

It is a law of the human mind that thought, in whatever form, like motion, short of some strong awakening impulse, tends to perpetuate itself in constantly recurring trains of association, unchanged, indefinitely. We daily see persons who actually pass through the longest terms of life without almost any attainment in moral or mental power and general knowledge to distinguish their most advanced age from their youth. Nay, they sometimes retrograde rather than advance, for mental power disused becomes or tends to become effete. The mill horse round is an apt enough illustration of the manner in which their days are spent. It is only through mental effort springing up within, or stimulus applied from without, that a change in the respects I have mentioned can be wrought. For knowledge will hardly come of itself. Psychical power cannot be realised without psychical effort. This law of intellectual inertia extends to all classes and conditions of men. It is a highly conservative law, since it preserves in its degree our individuality and identity, which else might incur risk of impairment and loss. But it also acts as a preservative of ignorance and error, tends to keep things stationary and without advancement. If, then, you would change, wholesomely, the current of thought in yourself or others, you must work to accomplish your purpose. The old thought will not give way to the new thought, or even keep company with it, without more or less strenuous effort. Any one cognisant of the processes of his own intellect, when there has been progress, must recollect his whilom adhesion to many things which he very well now knows to have been erroneous, utterly.

If mental inertia, however, have its uses, it also has its drawbacks. If we yield to it, unconditionally, it arrests all improve-

ment or advancement, whatsoever. Let us, indeed, hold fast by the old truth, but then let us also take on with the new. Let us not forswear all inquiry unless we desire to become as oysters. Unless we have the insane pretension of having arrived at all truth, we must be prepared to advance with the times. Nor is there any very great danger of advancing too fast. Nature has taken excellent care to prevent that. But for the most part we prefer not to disquiet ourselves too much. We are all inert enough. It is so much easier to take matters for granted. Thought is so troublesome, so difficult. We find it more convenient to sleep over it and be at rest.

Heaven preserve you, says the Spaniard, from all novelty. Most of us are Spaniards, in these respects, if we would but own it. We hate everything new or uncommon if it but give us the slightest trouble to think over it. We are, severally, averse to change. Therefore it is that innovators were ever pestilent people. When the thing, indeed, is established the innovator earns repute. We knew that he was right enough all along, should indeed have made the egg stand ourselves had we been in his place. But, then, we only find this out long after he has succeeded. Everybody is of his opinion, now. We have not the trouble of thinking over the matter any longer. It has become established truth. Until this period arrive, however, most innovators have had a trying enough time of it. Some have been burnt, others thrown into prison. A good many have been banished, and stripes, confiscation, neglect, starvation, and infamy, generally, were not considered bad enough for them. It is not necessary to enter into the personal history of successful innovators. Indeed, the greatest benefactors of our species have been treated with the utmost ridicule, contumely, and neglect. Every available means, present inflictions and prospective threats, were employed to put them down, and their innovations along with them. It would seem needless, did we not know from sad experience to the contrary, how important it is to insist on the extreme advantage it yields to the community that thoughtful men, men of deep research and original views, should be afforded fair play. For thought, profound speculation, sooner

or later governs the world. Fortunately, however, there is in the discoverer a something, a sort of divine life or fire, an inspiration, *sempiterna generis humani solatia*, that causes him to persevere. He must deliver himself of his thought, though all the conservators in the world, and *fama clamosa* and banishment and poverty and detraction, and death, itself, were to wage ceaseless war against him, and howl dissonant in his path. Alas, the world, or at least a certain portion of it, is prone, as the poet says, to sully brightness, and to drag even sublimity, itself, through the mire.* And, yet, the true discoverer has God and right reason on his side. For should he only be true to himself, the truth, he is assured, must needs in time prevail, no matter what the opposition may prove, and that *decus* and *laus perennis* and κῦδος ἀρέσθαι, are his secure possession for ever. Mankind, in respect of discoveries, are just as children are with bitter physic. The nauseous draught, the discovery, namely, which, with so much reluctance and loathing and disgust, they perforce swallow, they slowly, and, ah, how slowly, discover was good for them after all.

If, indeed, you want to know the strength of a fixed idea, only require a steady sectary to take up with the opinions of some other sectary. Ask a veteran lawyer to abandon the canons of the statute law. Tell a physician, could we only revive him, of some three hundred years syne, to believe that blood, not air, coursed through the arteries. Or, lastly, invite the Medico Chirurgical Society of London, or rather the few who, on a late occasion, so complacently assumed to represent it, to endorse my views on tubercle.

Speaking of vaccination, I remember, when a boy, to have seen caricatures depicting children with sprouting horns and the faces of cattle. Behold, said the opponents of vaccination, to what you would reduce your offspring. No abuse, indeed, was considered too unmitigated, no misstatement too unscrupulous, as applied to the bold innovator, who, for so it was imputed to him, proposed to take the conservancy of human life out of the

* Es liebt die Welt das Strahlende zu schwärzen,
Und das Erhabene in den Staub zu ziehn.
Doch, fürchte nicht, es giebt noch edlere Herzen,
Die für das Hohe, Himmlische erglühn.

hands of Providence, and proposed, insensate man, to avert smallpox by so preposterous an expedient as the introduction into childrens veins of lymph from sickly cows. There are, however, doctors and doctors. The Imperial Academy of Medicine in Paris appointed a Commission to inquire into my views on the production of tubercle. The Medico Chirurgical Society of London, or rather some four or five in its name, not only refused to discuss these views, or to thank me for propounding them, but proceeded afterwards, hear it, ye shades of Harvey and of Jenner, very seriously to discuss the alleged production of idiotcy from fruitless sucking in infancy. How is it possible for people to imbibe new views when they will not take the slightest trouble to understand them, and when subjects such as I have named, take precedence of topics which bear upon the welfare of born and unborn millions.

But inertia, whether it will or no, must give way. Indolence of thought, class prejudice, personal jealousy and animosity, all must yield in turn. Time is a mighty innovator, and time is with me, wholly. If my views be true, they must secure universal acceptance. If they be otherwise, no efforts of mine can secure them permanent currency. It is impossible, I aver, for consumption, for tubercle, to ensue, without some coextensive, all efficient working cause. Pulmonary and other forms of consumption, as dependent on the presence of tubercle, are not natural, but on the contrary unnatural, states of the living organism. They are induced by artificial, and, therefore, preventible, causes. What that artificial cause is, I have often stated. It is not bad feeding, hereditary influence, infection, or inflammation. No, it is the deposit of effete unoxidised tissue, in a word, the unconsumed metamorphic carbonaceous waste, within the living organism. I have investigated, more or less minutely, the history of multitudinous cases of tubercular consumption and scrofula, and have in every instance found that the disease was preceded by the respiration of air fouled by repeatedly passing through the lungs. For air fouled in any other way, however pernicious in itself, is entirely inoperative as respects the production of consumption and scrofula. When such a deoxygenated atmosphere is more or less habi-

tually respired during a sufficient period of each twentyfour hours, these diseases, one or both, ensue with the unvarying certainty of cause and effect. Not more certain is the sequence of night after day, than is the deposit of effete matter in the form of tubercle, by reason of rebreathed air.

As tubercle is deposited in every part of the organism of man, the lungs cellular tissue, serous mucous and, when they subsist, false membranes, lymphatic and other glands, spleen bones muscles heart brain spinal marrow spine skin joints and viscera, generally, so, also, does it abound, the conditions being otherwise favourable to its production, in all other breathing creatures. Very often it is the horse which is tubercle stricken and out of condition, to the great chagrin of dealers, who, understanding nothing of the matter, shut the poor brute up in yet closer, worse ventilated stables, than before, and so aggravate to his destruction the evil which they desired to remove. Still oftener it is the cow when kept, as she so frequently is, much within doors. The silk crop is many times endangered, nay lost, by the prevalence among spinning worms of a malady termed *muscardine*, which, as I have elsewhere stated, is, in fact, no other than tubercle, as engendered by the close, ill aired chambers in which these precious insects are too commonly confined. For the silkworm, as living and spinning in the open air and on the tree top, is quite exempt from *muscardine*. But the greatest and most frequent victim of all is man. He and his offspring, with the creatures dependent on him and shut up along with him, are carried off in myriads. Yet, the more enormous the destruction, the more zealously does he avoid a pure fresh atmosphere, the more frequently does he resort to useless and ridiculous, indeed, wholly inoperative and injurious, remedies, to the prejudice or neglect of the great appointed means, so far as the perfect avoidance of scrofula and consumption are concerned, for ensuring bodily health and welfare.

The body is integrated and disintegrated by reason of the interchange of its constituents, *Stoffwechsel*, or stuff change the Germans curtly term it, the stuff that man is made of, at the rate of from five to eight pounds, fluids and solids inclusive,

each several day.* The old or disintegrated portion is got rid of by oxidation and otherwise, heating the body in the act. But in order that oxidation should take place, efficiently, the air must not have been respired before. For air once breathed is quite unfit to breathe again, will not sustain combustion, or adequately consume the effete carbonaceous tissue. And as the living flame is quenched when brought in contact with air but once respired, so also is the life of man, sooner or later, itself quenched, when the lungs are supplied, when the organism is brought in contact, with a prerespired atmosphere. Without the oxidation and rejection of the metamorphic carbon waste, life comes to an end. The effete tissue is retained in the blood, and, by a sort of anticipated death, is laid down as tubercle in the living tissues.

The skin kidneys liver lungs, in fine, all the emunctories, all the outlets, play each their several parts in getting rid of the daily effete or metamorphic waste accruing from the incessant production and destruction of the organic particles. But the lungs afford infinitely the most important outlet, and it is through them that the blood in man discharges, or ought to discharge, some eight ounces of oxidised carbon or more, within each four and twenty hours. In the horse and cow the amount is greatly larger, rising, in the course of the period just named, to perhaps seventy ounces in the one, and eighty ounces in the other. The carbon thus discharged, I say, uniting with the oxygen of the atmosphere, is poured out in the form of carbonic acid gas, at the rate of from four to five per cent of every breath expired. But, if impure air, air impure in the sense of being prerespired, be habitually breathed, the metamorphic carbon waste does not adequately unite with oxygen, and is, therefore, sooner or later deposited in the living tissues. It is impossible, I assert, to arrive at any rational basis of treatment, or, what is yet more important, any effective prevention as regards these maladies, until this theory, as to the retention of effete tissue in the blood in consequence of its imperfect oxidation, find universal and practical acceptance at once among medical men and the community at large.

* Si cibus et potus unius diei sit ponderis octo librarum. Ars Sanctorii Sanctorii. *De Statica Medicina*, Lug. Bat. 1713, Aphorismus 6.

There was not the very slightest approach to any rational explanation of the real origin of tubercle until now. That which I offer is complete in all its parts. It accounts satisfactorily for the disposal of the effete metamorphic tissue, when retained from insufficient oxidation. It shows that tubercular deposits are the invariable issue of the imperfect combustion of the effete waste, and that without this there is, there can be, no tubercle. There never was even a colourable attempt at explanation before, I mean an explanation in accordance with the physiology and pathology of the case, and the real, not fancied, metamorphosis of tissue. For tubercle, in fact, is effete, that is to say dead matter within the living organism, causing pain, irritation, fever, and, finally, the destruction of the entire animal structure. The question, or yes or no, lies within a very narrow compass. Daily observation affirms it. Experiment proves it. It is easy for the candid inquirer to satisfy himself. He has but to analyse the evidence for the case. Any living breathing animal, furthermore, if confined in a limited air space, so as to constrain it without the risk of suffocation, to respire habitually, again and again, more or less, the same atmosphere, will, in some ten or twelve weeks, over or under, come to labour under tubercle. Tubercle, as thus, is invariably induced, and under no other known circumstances or conditions, whatever. The chemical processes of the living frame cannot, indeed, be well submitted to actual inspection, as are those in the laboratory. But when man or brute is placed in a position such as to prevent the effete metamorphic tissue from being properly oxidised, it needs very little power of imagination and ratiocination, seeing that there is no other possible alternative, to identify tubercle and effete tissue as one. In fine, experiment proves it. Observation proves it. The logical method of exclusion, otherwise exhaustive reasoning, proves it.

The Creator intends us, does he not, to live healthily. When diseases so extended, so persistent, and hitherto so inveterate, as those comprised under the generic terms consumption and scrofula, display themselves, generation after generation, among so many nations, over such widespread

regions, in every class and condition of men, and breathing creatures, generally, it is most certain, most true, that some law of health is coextensively violated. I have pointed out what that law is. It is that a fresh, pure, and unprebreathed atmosphere should be respired continually. The violation resides in respiring the same air oftener than once. If, indeed, we would secure health and avoid tubercle deposits in ourselves and our dependents, let us, let them, not breathe the same breath again. For this is the very, the imperative law of our animal being. If at each respiration we breathe air freshly renewed, we cannot incur tubercle, we cannot incur scrofula or consumption. If at each respiration we inspire air that has been inspired before, whether by ourselves or others, we cannot eventually avoid scrofula or consumption. I believe that, by the universal practical adoption of the views here insisted upon, there would ensue a perfect immunity from tubercular consumptive disease. Already, in my hands, it has rescued some, nay many, and what has rescued some, *pari ratione*, would rescue all. Despite of every opposition, and, worse than opposition, indifference, my views are already to some extent appreciated, and so long as I enjoy the privilege of respiring that air whose entirest purity I have so earnestly advocated, must I persist in their diffusion. Assuredly, a day will come when consumption and scrofula, those scourges of our species, will disappear. And I should desire no better epitaph than that it could be said I had been instrumental in inciting not only the medical profession but the thoughtful and reflecting of all professions, to the safekeeping of whose intelligence and philanthropy, after all, the matter may now be very safely consigned, in respect of the successful and thorough eradication of both.

ON TUBERCLE AND ITS GENESIS.

Read before the Dublin College of Physicians, May 21, 1862.

Those who bring new views before the world, and encounter, therefore, the usual meed of opposition and hostility, are apt to go back for comfort and encouragement to the case of their predecessors who, having overcome obstacles, proved successful in the end. Sometimes the promulgator of some wretched absurdity, a Priesnitz a Hannemann or a Gall, shall experience a degree of success wholly denied, at any rate for the moment, to the discoverers of truths of the utmost moment to their kind. The names of many such benefactors to their species, indeed, are utterly unknown. The innovator, in fact, is a wretch whom we put down just as our predecessors did in days of yore. New ideas are long ere they obtain a footing. We are satisfied with what we know, or rather with what we do not know, and so resist conviction while we can. A man, we shall say, spends long years in anxious investigation, and the first fool he meets ignores his proceedings, perhaps, ridicules his hard won conclusions. Not only knaves and fools, however, but persons of intelligence and worth reject the treasures that are tendered them. The history of discovery is full of humiliations. We all know the story of Galileo. Harvey and Jenner, to be sure, were not thrown into prison. For them no dungeon yawned or faggot was kindled, but they experienced, not the less, at least at first, every species of alternate misrepresentation, neglect, and abuse. But, if little be attempted, little will be done. The author of vaccination remained three months in London, displaying his procedure, but not a doctor would try it. Only very gradually was it adopted, and then, only, after prolonged indifference and active hostility. And, yet, said Cuvier, if vaccination were the only discovery of our epoch it ought to render it illustrious for ever. De Caus was thrust into a French madhouse for urging the

applications of steam. Stephensons plans were considered delusive, and himself little better than a maniac. But he would not be put down. Cort, who invented the hot blast, was, in fact, cheated by the Administration. The iron masters refused to discharge their indebtedness to him, and the man who had conferred unnumbered millions on his country died in poverty. A doctor in the Carolinas who invented the cotton gin, was plundered in open day, and the very name of the virtual founder of Manchester is unknown. Thilorier, who first condensed carbonic acid gas, and projected a carbonic acid gas engine, was pointed at in Paris streets as a fool. And the person who first registered the lesser circulation of the blood, a dreary fanatic burnt alive. The too frequent fate of the great innovators in morals and religion, from the earliest times, is pitiable to contemplate. Injustice, misrepresentation, and neglect dog those who, standing out before their time, are heedful of something beyond the sordid interests of the hour. Yet, sooner or later, as I have said, thought governs the world. And all true thinkers have sympathy with thought, do their utmost to shield those addicted to it from being dragged through the mire.

If we fail to disabuse the mind of preconceived error, we sadly imperil the interests of truth. The constructive or imaginative faculty, is infinitely essential to discovery. Without it, and unless coupled with well developed reasoning and observant faculties, there is no progress. We all know the great importance of sericulture. Well, the silkworm in the south of France and in the Lombardian plains, is assailed with a disease which the French term *muscardine*. This muscardine utterly impairs the production of the silk, and even causes the worm to perish before forming the cocoon. Muscardine, I am the first to assert, is no other than tubercle, as induced by the occupancy of stagnant chambers and rebreathed air. Liebig, in a recent discourse before the Academy of Sciences at Munich, ascribes muscardine to the inadequacy of those elements in the soil essential to the proper nurture of the mulberry tree and leaf. However correct in most other matters, Liebig is utterly in error, here. Open air culture, the nurture being otherwise the same, entirely exempts the silkworm from the opaque and milk white degene-

ration which invades its organism, in fine from tubercle. It further appears from some communications laid before the French Academy of Sciences, and reported in the *Comtes Rendus*, that the president of the agricultural society of the Drome, reared silkworms exposed to wind and rain in the open air, with the most perfect success. Whereas, of six hundred and fifty cocoons raised, indoors, fortytwo contained each a dead worm. Madame Pirodow, at Grenoble, produced excellent silk from worms reared from the egg in rooms with open windows, while the silk accruing from worms kept in heated chambers, with closed windows, was all but unsaleable. Further, Marshal Vaillant and M. de Quatrefages had with open air culture but four per cent of diseased worms. Count Taverna, Professors Chavennes, Zandonati, and Bellotti, by keeping the worms in wire cases on trees, obtained yet more surprising results, in fact, in a short time regenerated the worm.* The illustration which the foregoing affords is, indeed, precious. For our own species, when kept in air prerespired, languishes and perishes from human muscardine, from which, when immersed in air pure and unprerespired, like the worm, it remains exempt.

No portion of the British dominion, extended though it be, is blessed with a sweeter purer clime than are the Scilly Isles. The air of the great ocean hurries incessantly past each door, and, were it only permitted to do so, would sweep each and every impurity away. How is it, then, that the inhabitants of these thrice favoured isles are decimated, more than decimated, by tubercular disease. Why, indeed, but because they sleep in chambers, every casement closed, which, therefore, exclude, utterly, the balmy atmosphere that vainly woos them from without. Their blood is not depurated, the effete waste, the cleansings of the living frame, the particles ever hurrying to decay, are not burnt off, and are, therefore, arrested in the tissues. It is, in fact, the inversion of that process of purification, the severance of the matter which is dead from that

* Carlo Vittadini, 'Sul modo,' Sur la maniere de distinguer chez les vers à soie, la graine infectée de la graine malade. *Atti del R. Instituto Lombardo*, T. i. p. 1859. Quatrefages, *Sur les maladies actuelles des vers à soie.* Paris 1860. *Bibliotheque Universelle de Geneve*, Tome xiii, p. 353.

which lives, that subsists, or ought to subsist, in every living organism.

The New Zealanders, a highly imitative and intelligent race, have, it seems, been stricken with consumption ever since we came among them. They discarded their mats and, in imitation of civilisation, betook themselves to blankets and wooden houses, without proper doors or windows. In these, shut up and airless, the poor creatures swelter by twenties, the long nights, together, breathing again and again their own pulmonary and cutaneous excreta. The ill decarbonised blood becomes quickly saturated with its own impurities. And, within a brief period tubercle within and tubercle without, in a word phthisis and scrofula, consign the ingenious though luckless islanders to early doom.

Let us now contrast with the foregoing some other tracts, also under British rule, tracts far less favoured by nature than are the Scilly or New Zealand isles, but which, nevertheless, enjoy the enviable distinction of an almost complete exemption from a class of maladies which elsewhere devastate the world. The momentous fact has been fully established, among others, by Dr. Morgan an English physician, who resided seven years in the Island of Raasay.* The immunity of Raasay, itself, so arrested the doctors attention, that he forthwith instituted an inquiry, which led to the, to him astounding result that all the West Highlands and Islands were blessed with a like immunity from phthisis. Not a case, observes Mr. MacLean of Mull, in his reply to Dr. Morgan, had occurred among three hundred paupers during the preceding three years. In Tyree and Coll, writes Dr. Anderson, the disease is rare, very rare. In Barra, states the resident clergyman, there were but four or five cases in a population of eighteen hundred, and in South Uist and Benbecula, relates Dr. Mac Lean, but two or three had subsisted annually among six thousand souls. In Harris, where the population is four thousand or more, Dr. Clark, in a practice of thirty years, knew of but six cases, and two of these had come from Greenock. Of Stornaway, Dr. Miller bore a similar testimony. In filling up policies, his predecessor

* *British and Foreign Med. Chir. Rev.*, Oct. 1860.

used to state that consumption was unknown. As respects Sutherland, with eleven years practice and amid ten thousand persons, Dr. Mac Lean had rarely more than one or two cases of phthisis at one time under his charge. Dr. Robertson of Gairloch, met with but four cases amid five thousand people in the course of twelve years. The Rev. Mr. Mac Crae, of Glenelg, had not seen ten instances of consumption among thirty thousand persons in thirty years. Dr. Mathewson did not meet twenty cases in Portree in as many years. While in Dunvegan, Dr. Mac Alister had not witnessed a case at all during sixteen years.

It is an old tradition, observes the Registrar General of Scotland,* that the Western Isles are remarkably free from consumption, a freedom surpassing that of any locality to which we send our patients. The whole county of Argyle, he observes, with its islands, enjoys a like immunity. Yet, in Scotland, otherwise, the Registrar adds, consumption is the most fatal of all maladies, in fact, a ravening scourge, proving fatal to ten thousand persons each several year. Scrofula, says Dr. Mac Intosh, an Edinburgh lecturer and practitioner,† affects some member of almost every Scottish family. I can testify myself, indeed, from personal observation, to the extreme prevalence of consumption and scrofula in Edinburgh. The people live in flats or chambers, in houses of many storeys, the windows of which, night and day and always, are kept habitually closed. Yet, in a country wherein consumption and scrofula are else so rife, we find a district of immense extent, in which consumption and scrofula are, in fact, unknown. How is this. The answer is simple. It is owing to the way in which the inhabitants are housed, permitting, nay necessitating, a constant indraught of pure fresh unprebreathed air, and the not less incessant expulsion of the foul products of respiration. The people live in houses, some forty feet long by fifteen wide, constructed of rough stones more or less pervious, with doors that are rarely closed. In the centre of each cabin, on a raised hearth, a peat fire burns ceaselessly, rendering a stagnant atmosphere simply impossible. The upward current

* *Report*, 1861, p. 41.

† *Practice of Medicine*, 3d Ed., p. 241.

finds vent through an aperture of some eighteen inches diameter in the roof. Thus, it will be seen, that breathing an atmosphere for ever and for ever renewed, an atmosphere wholly unvitiated by irrespirable poisonous lung excretions, an atmosphere, I say, untrammeled by partition walls or ceilings or chimneys, the blood of the western Highlander and Islander, indoor and out of door, is continually decarbonised, and cannot, therefore, let fall those deposits which, ever since 1855, I maintain are no other than what we call tubercle, the *vera causa*, in fine, the one and only source, and very essence, of consumption and scrofula with all their related ills.

The connexion between tuberculous disease and an atmosphere more or less fouled, had, indeed, been insisted upon. But those who thus insisted, drew no distinction between air as fouled by respiration and air fouled from other sources. Now, it is the first, only, which is productive of tubercular consumption. It was not, however, until in the autumn of 1855, that the luminous conception that prerespired air, and prerespired air only, induced tubercle, dawned on my astonished and gratified consciousness, a conception destined, so soon as it shall be turned to account, to realise balm and healing, one day, to born and unborn millions.

The Cornish miner works fathoms deep, below bank, in a hot close environment, debarred of light and unprerespired air, while at night, for all so intelligent as he is, he sleeps in some wretched ill aired cabin, so that according to Barham, half the miners die of consumption between the ages of thirty-five and fifty. Of course this blood is not properly decarbonised, the effete tissue is not fitly got rid of, and, therefore, it is laid down as what we term tubercle in the else living economy. Yet, the electric light, as I proposed long years since, would harmlessly illume the mine, and skill and care would ventilate it, while with open windows by night in the miners dwellings, miners consumption would become infrequent as it is now unhappily otherwise. If Mr. Robertes, to whose munificence the miners hospital at Redruth is owing, would but employ his influence and his means towards the better lighting and ventilation of Cornish mines, and sanifying, to coin a word, the

Cornish miners dwelling, the Cornish people would become a healthy one, and hospitals for the consumptive, because not needed, would become unknown.

Exceptions, it has been said, prove the rule. But here is a rule to which there is no exception. If we only breathe an unsullied unprebreathed atmosphere, the blood will be decarbonised, cleansed. But if the twentyone per cent or so of oxygen in the natural atmosphere be replaced, more or less, by the vile products of respiration, the inevitable result will be the deposit of the uneliminated metamorphic tissue within, instead of without the boundaries of the organism. Some few years since a girl became my patient for frightful scrofulous ulceration, attended with the usual discharges, in the neck. It was coupled with amenorrhoea. The worry of her malady, with its precursors and accompaniments, was, apparently, hurrying her fast to the grave. She had been trotted through the usual round, and more than the usual round, of remedies. The chloride of barium, burnt sponge, and cod oil were freely exhibited, each in its turn, and then abandoned. Once it was actually proposed to excise the ulcers. Fortunately, she was spared this mutilation. At last, the young lady was brought to me whose patient she had once been before, for at an early age, I arrested, as I believe, in her the symptoms of mesenteric phthisis. I first touched the ulcers, lightly, with the nitrate of silver, then dressed them with simple water dressing. I prescribed porter, wine, cream and curd, with other desirable sustenance, along with the potassio tartrate, and other pleasant forms of iron. I made her take a daily moderate walk, and otherwise ride many miles. As soon as the season favoured, I sent her to the sea, insisting, at all times, on perfectly open windows by night. After a time the ulcers healed, the amenorrhoea disappeared, and health returned again. She is now married, retains her active habits, and promises to enjoy a long exemption from disease.

But tubercle is an insatiate scourge. The supineness of the multitude is only equalled by their ignorance. Even in quarters where it might be least expected, the simple yet magnifi-

* *Sanitary State of Truro. Report on the Condition of Children in Mines.*

cent truths of zoochemistry and physiology are all but unknown. How, indeed, are we to reason on the nature and causes of disease with those who are unaware of the laws and conditions which underlie all health all disease. I challenge investigation, I tender proof. Remove prerespired air and you remove tubercle along with it. You can no more have one without the other, than you can have an effect without a cause. For why, they are effect and cause. You cannot have consumption and scrofula without imperfect hematosis, or imperfect hematosis, as thus, without prebreathed air. Facts are congruous with my theory. All the phenomena of disease give consent. This theory explains as nothing else explains the empirical chaos into which we have fallen, and the cause of the great frequency of a malady, of tubercle, which, to the disgrace of medicine and the extreme prejudice of the community, we have so long to put up with.

God has given the people of the moist county of Cornwall just as pure an atmosphere and just as great an amount of moisture as have been imparted to the cottagers of the moist and misty west Highlands and Islands. The grass is as green, the sea the same as that which exults and roars along the brine washed Hebrides. Nature is just as bounteous to the one as to the other in respect of every element of joyous life and being. To Cornwall, indeed, she has granted a yet more genial climate. But it avails little. For in Cornwall consumption is so rife as to be called the miners disease, whereas, in the Hebrides there is no consumption at all. If Cornish folk, speaking of the miners, for the Cornish agriculturalists are comparatively healthy, would but send their children to board with the poor cottiers of the Hebrides, they would grow up absolutely exempt from the deadly maladies otherwise almost certain to assail them. But if they will not do this, let them do as the Hebrideans do, let them admit within doors, all night through, the moist and sea washed atmosphere, and the joyous winds would just as surely sweep the deadly venom of disease away.

The organism must be treated according to its requirements. But the need of food rationally speaking is not more urgent than

that of pure unprerespired air. Oh, yes, it will be said, we all know that, it needs no ghost to tell us that. We cannot do without air. Well, then, if it be such a truism, how is it that people everywhere sleep with closed doors and windows, and suffer their wives, their children, and their servants, like the poor sootmakers of St. Kilda, to be devoured by phthisis. Surely to God, one use of air, at least unprerespired air, is to be breathed. But how is such air to permeate glass or brick or stone. If we believe in fresh air so, all of us, why do we not breathe it more, and make greater use of it than we do. I remember, oftener than once, to have addressed assemblages of medical men on the subject of tubercle, if not in marble halls, at least in halls of wood and stone, where the air, by reason of its unchangedness, was far very far from being what could be desired. I submit that in this respect we ought to set an example to the entire world. Hospitals, erected at vast expense, subsist, where, whatever may be said about air, there is a perfect plethora of drugs. How many are sufficiently aware that air once respired will not sustain combustion, and, if it be alone respired, that it proves promptly fatal to animal life. In this very month of April, 1862, one hundred swine were placed in a railway van in Norwich, and covered by some over careful porter with a tarpaulin in order to keep out the rain. He kept it out, indeed, and the unprebreathed air along with it, so that on arriving at Peterborough, the poor animals, seeming preternaturally quiet, an inquisitive official found that all save three were dead. Not long since a mother snugged up her baby so, with endless wraps and covers, that on taking it out, its little life was sped. The smothering of infants, indeed, is of incessant recurrence. There is a perfectly doltish want of the commonest sense in respect of the all essentialness of unprerespired air. Some escaped lunatic, we must suppose, wrote an essay in a certain journal to prove, it would seem, that because fowls, forsooth, slept with their heads under their wings, and dogs and foxes covered their noses with their tails, and soldiers on bivouac lay with the coat flap thrown loosely over their faces, therefore, they severally did so, not for what some might think the ob-

vious intention of securing warmth, but to exclude renewed air. If instead of writing nonsense, the essayist had held a mirror over the heads of these sleeping creatures, he would have seen the glass moist with the moisture of the breath, and in all of them he would have witnessed a complete ingress and egress of the atmosphere, an ingress and an egress just as perfect as should subsist in his own case, were he to place his hand before his face, haply ashamed of uttering such inanities. No, nature does nothing wrong or in vain, she leaves such things to imaginative journalists.

How different, indeed, are the results when fresh unprebreathed air is really excluded. Thus, in 1823, one hundred and ten poor little boys were actually suffocated in a church in Malta. Thus, further, was it when the inhuman Surajah Dowlah shut up Mr. Holwell and his one hundred and fortysix companions in a cube of eighteen feet on a side, during a close sultry night in Bengal, but twentythree surviving. It was so in the Liverpool and Sligo steamer when the stolid captain, although the cabin was quite unoccupied, put away under hatch and tarpaulin, during a gale, his two hundred poor countrymen, seventy and upwards perishing ere the morn. But many such instances are not wanting. Crabbe, the poet, describes his narrow escape when confined with a number of others, during his early days, in an airless hole. Horace Walpole, in his Letters,* relates how a pack of drunken constables thrust six and twenty women into St. Martins watchhouse. Of these, four were dead by the morning, two perished afterwards, and a dozen more, continues Walpole, are in a shocking way. One of the victims was a poor woman, great with child, returning home late from washing. Lastly, three hundred Austrian prisoners were thrust into some frightful dungeon, after the battle of Austerlitz, when actually two hundred and sixty of the unhappy creatures quickly perished.†

Prisoners and lunatics, indeed, are tubercle beset, when confined in airless cells. Growing girls and boys, alas, are doomed to tuberculosis, as surely as lambs are doomed to the knife.

* *Letters*, Lord Dovers Ed. Vol. I., p. 214.
† Van Hasselt, *Vergiftleer*, Te Utrecht 1856, p. 219.

Mans breath, indeed, is poison, poison to himself and the creatures his dependents. Like his master, the horse cannot subsist without unprebreathed air, and tubercle is of necessity deposited in his tissues unless the metamorphic waste be not properly eliminated from his lungs, daily. These are no imaginary or hypothetical averments. They are true as that grass grows or that water flows.

Prejudice and ignorance alike beset our civilisation. We lure by craft or detain by force the creatures of the wild from their native haunts, then shut them up bereft of light and air until, tubercle stricken, they die. The flower of our people, clad in wars red trappings, smothered and smothering, perish, tubercle infected, then are borne away in solemn mockery, to the strains of the Dead March in Saul. The finest young persons, of both sexes, debarred of adequate open air life and effort and unprerespired bedroom air, are done to death in boarding schools at home and abroad. Schoolmasters and schoolmistresses are quite besotted on the point of outside air, shriek at the bare mention of its introduction by night. Yet, with proper coverings night ventilation is infinitely safe, would affect us no more than the bird on the tree. Yes, the air by night is indeed, wholesome, not the pent up unrenewed chamber atmosphere, but the pure sweet unsullied breath of night.

The treatment which female servants experience, even in houses of opulence, is often most reprehensible. This has not escaped the sharp observance of Miss Martineau, who adverts to the subject in one of her books with just severity. It is sickening to think of the probable fate of the many young girls who, blooming with youth and health, resort yearly in shoals to our great cities. First, their florid looks vanish and are replaced by a sallow waxy hue, their eyes lose their lustre and their breath its sweetness, the uterine and digestive functions become deranged, utterly, their strength declines, intercurrent pleurisy ensues, bloody and purulent sputa, with night sweats and hectic from the absorption of decaying pus, and general emaciation soon follow, and the young victims, discharged from place, if unable to reach home, slink into some wretched lodging, and quickly vanish from lifes to them

sad arena. In the great metropolis there cannot well be fewer than a couple of hundred thousand female servants and maids of all work, probably throughout Britain a million, besides, all more or less subjected to deleterious influences, evil miasms, seldom getting out, and sleeping, perchance, in some wretched garret, or other airless den. A consumptive servant from a Princes Street hotel, in Edinburgh, told me that his place of repose and that of his fellow servants, the men separated from the women by a wooden partition, was a kind of recess behind the bar without any direct light or air. The ravages which I almost daily witness among persons in this class, alone, are simply heart rending. It is difficult to reverse the evil which has been inflicted on them, difficult in itself, and further difficult on the score of absent means and appliances, and the almost complete impossibility of inducing them to adopt reasonable precautions or to submit steadily to any sustained and serial treatment.

A girl little more than twelve, one of very many such, had been with me on various occasions. She has scrofulous swellings in both groins, almost as large as turkey eggs, as well as on each side of the neck, disfiguring her utterly. Not long since I picked up an intelligent female child on the sea quays and a boy on the road. They were perfect prodigies, in respect of their inflictions, of scrofulous malignity. Their poor limbs, their eyes, their nostrils, their very ears, had undergone unparalleled degradation, a degree of deformity which I cannot find words to paint. Numbers, three or four, perhaps, thus offer themselves, at once, some more, some less, but all miserably afflicted. A little boy presented himself, of his own accord, this day. Sir, said the child, I have come for your advice. His poor face was one mass of scrofulous deformity from the ravages of tubercle. I am unable to give expression to the feelings with which the sight of this frightful violation of nature, of the divine prescription, affects me. Our all believing ancestors had implicit faith in the kings touch. But we cap this absurdity by our reliance on codfish oil. Ah, there is yet a better remedy than liver oil, a more regal touch than that of kings or queens. We must nourish, liberally. We must resort to iron, to abundant coverings, exercise beneath the free heavens, and unprebreathed air at all times.

ON THE PREVENTIBILITY OF TUBERCULAR CONSUMPTION.

Read before the Medical Society of London, October 27, 1862.

I. No living organism can subsist, healthily, without incessantly renewed air, and the rejection, as incessantly, of the metamorphic carbonaceous waste. It is the case with the inferior races. It is eminently the case with man.

II. A continually renewed atmosphere is required in order to burn off the effete tissue and to decarbonise the blood. Short of this, the metamorphic waste is not got rid of, and the blood is not rendered pure.

III. Exercise in the open air, *sub divo*, and, particularly, exercise of the respiratory organs, acts as ancillary in regard of the oxidation of the metamorphic waste. But exercise without fresh air will not get rid of the waste, will not avert tubercular disease.

IV. The skin, intestines, kidneys, and, especially in warm climates, the liver, discharge, it is true, effete carbon, but do not, except in small part, replace the lungs. For if these, the lungs, do not act with vigour, if unprebreathed air be not their pabulum, no other organ can supply their place, no other pabulum will suffice.

V. The lungs chief office is to take in pure air and, through oxidation, to get rid of the carbon waste, at the same time regenerating the blood and heating the body in the process. Whether the inspired oxygen come in contact with the effete tissue in the lungs or, more probably, in the torrent of the circulation, one or both, the results, both in theory and in fact, amount to one and the same thing.

VI. No food, as food, but waste, only, is excreted by the lungs. Their essential function is to purify the blood and to furnish the main outlet of the effete carbonaceous tissue. It

is the waste, alone, the retrograde material, in fine, that has already served the purposes of the living organism, that is so disposed of. And of this waste it is only the carbonaceous and hydrogenous portion that is, as thus, burnt off. The lungs excrete effete carbon and effete hydrogen, but not until after precombustion, which, itself, only ensues after these decayed matters have served the purposes of the living organism, in which they have become dead and waste, and, to which, unless thus or otherwise eliminated, they prove in the very last degree, hurtful and injurious.

VII. The solid food requirements of mans frame amount to from two to three pounds, daily, say a pound of meat and a pound of bread, or their equivalents. The fluid sustenance, likewise, amounts to from three to five pounds, or so, daily. There are, conversely, some two pounds of solid and three pounds of fluid daily waste. Of the solid waste, half a pound or, perhaps, a little more, of solid carbon, in the form of some thirty ounces carbonic acid gas, and from a pint and upwards of water, finds, or ought to find, daily issue from the lungs. If this process be permanently interrupted or perverted, I mean in part, for the total interruption would be instant death, the immediate result is want of harmony in the functions, while the eventual result is, perhaps, their remediless ruin and utter decay.

VIII. In healthy adult life there is a nearly perfect balance between the daily metamorphic waste and the daily supply. But during unhealthy life this balance is deranged, and the waste and dead excreta are retained, more or less, in the living organism, where they cannot without prejudice long remain. The perfect balance is disturbed, and this disturbance originates fresh disturbance in its turn.

IX. It is the province of physiology and pathology, alike, to throw light on the phenomena of disease, to explain them often, and, when possible, to prevent them always. Now, imperfect oxidation, with imperfect pulmonary excretion, leads, I assert, to consumption. Whereas perfect oxidation, with perfect pulmonary excretion, prevents, I affirm, consumption, averts the deposit of the effete or metamorphic waste, and

hinders its further deposit, should any, meanwhile, unhappily have taken place. In fine, an efficient pulmonary excretion must prove the only possible available or certain correlative in respect of our efforts for the prevention and removal of tubercular disease.

X. For the insufficient discharge of the metamorphic carbonaceous waste, because of imperfect oxidation, leads of necessity to the accumulation of this waste in the blood, and its subsequent final deposit, in the form of tubercle, in the living tissues, entailing hectic wasting and decay, in fine, the morbid phenomena unhappily so well known under the designations of scrofula, tubercular consumption, phthisis, and, finally, death.

XI. The foreign body, for it is no other, by medical men termed tubercle, thus, and only thus, laid down in the living organism, is incompatible with the continuance of healthy life, and, eventually, of life at all. The ravages which it occasions, immense as they are, are hardly appreciated even by those whose special calling it is to do so. For, the one hundred thousand persons who die annually of phthisis in Great Britain and Ireland, do not include, except in part, the mortality from scrofula, at all. These ravages extend, not only to our own species, but to the brute, when the brute is placed under the unnatural, forced, and constrained conditions which induce them in man.

XII. All kinds of mutually subversive, and, in truth, absurd hypotheses, have been imagined to explain the origin of a deposit, tubercle, to wit, so entirely opposed to the *norma* of wholesome life and natures beneficent requirements, except that which I allege, the repeated inspiration, namely, in man and animals, of air that has been already respired. No hypothesis, I affirm, will account for the phenomena of the disease or for the retained metamorphic waste, no theory, save that which I assign, that is to say, the habitual respiration of one and the same atmosphere, in a word, the breathing of already breathed air. If the same breath be not again breathed, if there be no twice told respiration of the same atmosphere, there can be no material delay in the elimination of

the metamorphic waste, no deposit of effete carbon in the guise of tubercle, in fine, no consumption and no scrofula. For, so surely as man rebreathes his own breath, or the breath of his fellows, so surely will it conduct, sooner or later, to disease and death. And when he breathes air not breathed before, it leads, as surely, at least as surely as the respiration of pure air can lead, to health and life.

XIII. The metamorphic carbonaceous waste laid down in the living tissues, under the heretofore unmeaning designation of tubercle, is a dead deposit, in fine, a *caput mortuum*, utterly unorganised and effete. It has, in truth, no more life or organisation than has the dirt in our path or the stone in the wall. Nature, who would prevent tubercular deposits, if she could, does what she can to get rid of them when deposited. And she would succeed, oftener, were it not for the negative treatment and insane mode of living too commonly adopted. Under these evil circumstances, I say, the blood is poorly oxidised, imperfectly depurated and decarbonised. At the same time, what with the irritation from the extant deposits, intercurrent bronchitis, pleuritis, and pneumonia, as well hemorrhages more or less violent, from the lungs, such organic changes and functional disorder ensue, such consuming hectic, such wasting diarrhoea languor and loss of appetite, as in no long period bring life itself to a close.

XIV. The blood cannot become impure, so far at least as the arrest of the carbonaceous waste is concerned, if we only respire an atmosphere unprebreathed. And, *à fortiori*, there can be no tubercular deposits so long as we breathe air not breathed before. For the bloods impurity, at least as connected with tubercular deposits, I again and again iterate, results entirely from breathing air already breathed, thus hindering the oxidation and elimination of the waste. During healthy life, the bloods impurities are purged from it, *pari passu*, as they form. But during unhealthy respiration, the bloods impurities are not purged, or, at least, adequately purged out of it. For if the blood be the conduit of living sustenance, it also acts as a sort of *égout* or sewer, in respect of the interstitial waste. Nature desires that this sewage matter

should flow out of the body. But if it flow in, instead of out, what can come of it but disease and death.

XV. Nature does nothing by halves, inflicts nothing in vain. But her secrets are only disclosed to those who employ a just and pertinacious questioning. Now, I submit that the theory of tubercle formation, as induced by the bloods foulness, itself induced by respiring the very products of respiration, yields an example of this just and pertinacious questioning. To the indolent perfunctory inquirer, nature in truth, has nothing to reveal. But inquirers have not gone on the right track, nor have they been sufficiently pertinacious. Our shelves are loaded with treatises. Every gurgle, every wheeze and rattle, each modification of the voice and of the chests sonoreity, each and every plaint on the long road to death, have been again and again registered. Remedies, absurd as they are unnatural, have been thrust into notice, then forgotten, while the malady, unchecked, not the less pursues its ravening course. If I have been so fortunate as to discover the *vera causa*, the only one, of tubercular disease, it is because I have not only had sufficient pertinacity, but because, as I trust, I have taken the right course. For it is the twice respired atmosphere, breathing ones own breath or the breath of others, in fine, poisoning the blood and inducing deposits of dead effete matter within the organism, that alone induces scrofula and decline. Even as I write, a boy of fifteen and a girl of twelve, instances out of countless similar instances, have been brought before me. The girls neck and face are seamed and seared with cicatrices, innumerable. Her right hand, every joint, diseased, is cramped and wrinkled like a birds claw. An abscess with probable spinal caries is forming in the lumbar region, while white swelling, so named, is imminent in one knee. The boy, *mutatis mutandis*, is afflicted similarly.

XVI. The one and only cause, then, of consumption in all its forms, of scrofula in all its forms, I assert, is the retention of the carbonaceous waste, owing to breathing again and again the same breath. And the one, the only preventative, I affirm, is not to breathe afresh ones own breath or the breath of others, in a word, consists in destroying and neutralising,

wholly, the perilous agency of air loaded with the dead effete matters poured into it by and through the act of respiration. If this, I say, be done, many are the ancillaries which tend to avert and remedy disease. But if this be not done, there are, there can be, in this instance at least, none.

XVII. These views are more or less, and, yet, all too feebly, appreciated. The difficulty I experience is that of obtaining an impartial and competent hearing. My views have been condemned by those who never were at the pains to weigh or rightly understand them, and yet pretend to judge. It needs some conversancy, does it not, with the principles of zoochemistry and physiology, as well with the art of reasoning, itself, to decide in a matter of such infinite moment. But progress, too often, is encountered with jealousy and dread, or met with stony indifference, even by those at whose hands appreciation, it might seem, were fairly due.

XVIII. Among the obstacles with which the herald of some fresh discovery has to contend, is very often the impatience, not to say reticence, of those with whom he has to deal. At bottom they are, perhaps, competent as he is to appreciate the reality of what he announces. But, influenced by various motives, they will not coerce their attention sufficiently to listen to him or condescend to the merits of the case. They have gone too long in a different track, are too well satisfied with what they know or rather with what they do not know, and so decide not to move at all. Then, again, the capacity of weighing evidence and testing facts, in seeming disaccordance with past experience and long cherished associations, is nearly as uncommon, perhaps, as is the precious faculty of discerning new truth itself. With the honest and upright objector, even when quite in error, it is however comparatively easy to deal. For objections uttered in a sincere and candid spirit, not merely put the discoverer on his mettle, but often serve to multiply new points of view themselves.

XIX. The existence of great vital laws, laws most certain most irreversible, with the consequences of their violation, particularly in reference to the function of respiration, is not sufficiently held in view. It is not clearly if at all admitted that

maladies so widely spread, so devastating, as are scrofula and consumption, must of necessity spring from some equally flagrant violation of these laws, in fact, from the perversion of the lung function itself, and the inhalation of an atmosphere charged with the altogether unwholesome, and, in fact, deadly products of respiration. This violation I have not only signalised, but have shown how to avoid. And it may now with entirest confidence be asserted that the world can be freed from scrofula and consumption, alike, so soon as men shall decide upon conforming to those most certain laws of life and organisation, the violation of which entails certain disease, and the observance, as unerringly, health.

XX. Impurity, merely, of the atmosphere, say as generated by putrefaction, is not productive of tubercular consumption. It is only the atmospheric impurity which arises from the act of respiration, hindering, when breathed, the oxidation and rejection of the interstitial carbonaceous waste, that entails this malady. This is a view which is simple as it is explicit. It is the only one which wholly consorts with, and entirely elucidates, the phenomena of the disease.

XXI. My opponents, therefore, or some of them, transgress the first principles of logic, show themselves unwitting of the matter in dispute, are guilty of the *ignoratio elenchi* of confutation. For they attack, imputing it to me, the general proposition, foul air induces consumption. Whereas, my statement is that not merely foul air, but that a particular kind of foul air, to wit, rebreathed air, alone induces consumption. If I, myself, were to charge the whole profession of medicine, all thinking British men, which heaven forbid, with logical blundering and incompetence, because my one or two or three or four or more assailants had proved themselves ignorant of logical proof and rule, this, too, would be an instance of the *ignoratio elenchi.*

XXII. For air fouled with putrefactive stenches to the uttermost, as may be witnessed in regard of the workmen in the great knackers yard of Montfaucon at Paris and the London nightmen, will not necessarily impair health, will not induce consumption, so long as the air respired is free from the imme-

diate products of respiration. It is not the foul stenches, assuredly, which here redound to health, but only the outdoor life, the abundant oxygen, and the utter absence of an atmosphere rife with the thrice baneful products of respiration. In fact, my opponents, whether through ignorance or heedlessness, have not discriminated between air as fouled by mere stench, and air fouled with the breath of man and brute. And, yet, the distinction is immense. It is prebreathed air, and prebreathed air, only, that conducts, or can conduct, consumption being understood, to tubercle deposits and death.

XXIII. Anterior to my inquiry into the real nature and *indoles* of scrofula, no one ever, no never since medicine was an art, ascribed it exclusively to rebreathing the same air, causing, indeed, remora of the carbonaceous waste, and its deposit, as tubercle, in the living tissues. To assert, therefore, that my views are five hundred years old, is merely to repeat the favourite subterfuge, or at any rate the logical blunder, already exposed, of those who simply evade a sound argument and repeat the *ignoratio elenchi*, entirely passing by the real point at issue. As held and propounded by me, these views were never held, never originated before. They are nowhere to be met with in the writings of the fathers of medicine. They are not found in the pages of Hippocrates or Galen or Aretaeus or Celsus or Rhazes or Avicenna or Paracelsus or Zacutus Lusitanus or Fernelius or Sennertus or Baglivi or Morton or Sydenham or De Haen, in either Peter or Joseph Franks writings, in Haller or Hoffmann or Boerhaave or Hufeland, or others of the multitudinous writers whose works I have perused, even up to our own day. The first, indeed, in modern times who, so far as I know, approached the subject with anything like appreciation, was the Spaniard Servetus, a philosopher, and, unhappily for himself, a theologian, but not a physician, at least in the English sense of the term. Adverting, briefly, in his *Restitutio Christianismi*, to the lesser circulation, the blood, he says, is freed in the lungs from its impurities, which pass away like smoke, as, indeed, they do. Under the name, nitro aerial spirit, Mayo seems to have had some inkling of the utilities of oxygen. Baudelocque, Fourcault, Clarke, Carmi-

chael, Ancell, Lombard, Baly, Barlow, Simon, and others, of our own period, all advert, more or less cogently, to the production of phthisis and scrofula from the respiration of foul air. But they do not, any of them, refer these maladies, as I do, unconditionally, to rebreathed air. And, one and all, they were unaware that the twice respired atmosphere it is which induces arrest of the metamorphic interstitial waste, and, under the guise of tubercle, leads to its invasion of the living tissues.

XXIV. The proper treatment and prophylaxis of tubercular affections, as founded on a correct science of zoo or animal chemistry, are virtually inoperative, and so must remain until the universal adoption, practically and theoretically, of a pathology, a treatment, and a prophylaxis, conformable to sounder views. The fact of the horrible and, up to this day, unchecked ravages of scrofula and consumption, I would urge in proof of my averments. These are ravages that never can be met or measured until the priceless worth of a taintless unprerespired atmosphere shall be fully acknowledged and appreciated, both in theory and in practice, over the entire world.

XXV. Foul air, as air that has already served the purposes of the living organism, air that has been breathed before, I have shown alike by reasoned observation and experiment, alone conducts, or can conduct, to that condition of the blood which produces tubercle deposits, leads to disease and death. It is impossible to be too explicit in this matter. Air respired by man or brute, and again respired, produces and alone produces consumption and scrofula. It does so, because it entails the surcease of the bloods decarbonisation, the sufficient egress of the metamorphic carbonaceous waste by its great natural outlet, the lungs. Hence, the remora of that waste in the blood, hence, too, its final deposit, in gradually augmenting masses, in the guise of tubercle. For tubercle is no other than the retrograde or interstitial waste, and, conversely, this waste, as deposited in the tissues, is no other than tubercle. Conversely and conversely, then, they are the same, in short, six of one and half a dozen of the other.

XXVI. Through judicious appliances, with fullest reliance on

natures law, it is completely and absolutely at the disposal of the community, of all communities, now and for ever, to interdict the further ravages of scrofula and decline. Medical men, if only once well persuaded, could arrest them not alone among their patients, but themselves. Parents might stay them in their children, masters and employers in their men, teachers in their pupils. In fine, all who hold sovereignty over, or direct in any wise the life and destinies of others, might divert and absolutely turn aside, within the range of their control, any and every form of scrofulous consumptive disease. It is but to obey natures great indefeasible verdict and command. Thou shalt not breathe prebreathed air, whether by night or yet by day. It is the violation of this law of sound breathing that entails, and has ever entailed, both scrofula and decline. And it is obedience to this law, both to day and so long as our species may endure, only, that can yield absolute exemption from the ravages of both.

ON CERTAIN VITAL AND HITHERTO UNDETECTED RELATIONS SUBSISTING BETWEEN THE LIVING ORGANISM AND THE OUTER ATMOSPHERE.

Read before the Surgical Society of Ireland, College of Surgeons, April 13, 1864.

When we speak of the atmosphere as subservient to the uses of living and breathing organisms, we must carefully discriminate between the atmosphere of houses and the atmosphere as exterior to houses. In respect of certain vital and, up to this period, unobserved essentials, the influence of the one is very different, indeed, from that of the other.

It might well be assumed that as civilisation advanced, disease should diminish and life be rendered more secure. In various particulars this is undoubtedly the case. For, some diseases are far less frequent, and lifes mean duration is in fact prolonged. Our civilisation, however, is still most imperfect. It does not take into sufficient account the problems, moral and material, essential to progress, and we suffer, accordingly. But the objects of this paper are not simply moral ones. Its objects are the declaration and exposition of certain momentous and heretofore unsuspected relations, subsisting between the living organism and the outer world of the atmosphere.

Some diseases, leprosy for example, scurvy for example, have, it is true, become more infrequent. But to this law of advancing civilisation, there are, nevertheless, certain flagrant exceptions. Insanity, if anything, and consumption, if anything, are not less, but it would actually seem more frequent than heretofore. Now, it is of consumption, and of the *rationale* of the perversion of function which induces it, up to the date of my discovery unknown, that I would here desire to speak.

The literature of consumption is something immense. But, if we except the description, and, so far as it goes, the natural

history of the disease, that literature is little better than a twisting of ropes of sand, a churning of water, a thrashing of empty straw. The violation of the thrice essential relations that subsist between the living organism and the outer atmosphere, in a word, the infractions that result in tubercle, have till now remained unknown.

It is not only that consumption proper is excessively frequent,* but that tubercle, frequently quite undetected during life, implicates other maladies as well, precipitating them to serious and too often, remediless issues. Tubercle invades not merely the lung structure, but, more or less masked, more or less disguised, other tissues, other organs, as well. It invades the throat, joints, secretory and excretory glands, the bodies of the vertebrae, the larynx and trachea, the brain and nerves, in fine the hard and soft parts, generally, and carries off multitudes. Yes, tubercle implicates now one structure, now another, often many structures, simultaneously. Frightful abscesses, burrowing sinuses, perchance form, and the economy degenerates, utterly.

Eloquent voices descant in rolling periods on disease. In fair volumes are discussed the momentous problems of life and death. Yet, are there other instructors and a far different volume which, if we do not adequately heed, our varied culture goes for nought. It is, indeed, needful to interrogate nature, incessantly, to consider the bloods courses, the nerves play. But all this will not suffice unless we also study the part performed by food, the integration and disintegration of tissues, and, more especially, the action of air, not prerespired, so indispensable to each and every living organism.

The conditions of existence, as regulated and dictated by nature, are simple and effective in the extreme. And it is only when, through ignorance, heedlessness, or the strong coercion of necessity we infringe them, that we suffer. Man and the inferior animals are surrounded by the great ocean of the atmosphere, adequate, more than adequate, for every vital re-

* Fléau d'un grand nombre de contrées, plaie de tontes les grandes villes où elle n'epargne aucune classe de la societé, et dont elle dégrade et abatardit la population. Baudelocque, *Mal. Scrophuleuse*, Preface.

quirement. It envelopes us as with a garment, it maintains our bodily warmth. It purifies, nurtures, and matures the blood. For our sustenance in a sense is threefold, the solid aliment we take in, the water we imbibe, the air we inhale. Of these three, nature, by a wondrous forecast, elaborates two, without cost as it were, and to hand. Although we may, with more or less impunity, have temporary recourse to inadequate sustenance, air, as a myriad instances show, as a myriad instances prove, fouled by carbonaceous respiratory waste, we cannot long with any safety respire.*

The question of pure air or foul, for breathing purposes, is one that imports the interests, nay, the very life and well-being of born and unborn millions. There are just now public saloons whence persons are taken fainting, halls of learning and debate, workrooms, but above all, school and sleeping chambers unfitted, the state of the contained air being considered, for the occupation of a torpid bear. Nay, horses are all but suffocated in their stables, cattle in their stalls, in ships holds, and, even in railway vans. How frequently human beings are subject to like peril, let the annals of our kind declare. Must I here undertake to prove that unprebreathed air is better than breathed, that animal life is most surely militated against by an atmosphere that has already served the purposes of the living organism.† It is a natural law, one from which there is really no appeal. And yet air but once respired, though it will no longer aliment flame or sustain life, still contains some sixteen or seventeen per cent of free or uncombined oxygen. Man and brute then, alike, sooner or later perish, when plunged in a medium more or less loaded with the impure products of respiration. He who requires evidence of this must be indeed hard to convince. And, yet, that it is a fact, results from the dearly bought experience of every nation and time. But such disastrous results, some may allege, do not often happen. Alas, they do happen, inces-

* La respiration d'un air non renouvelé vicie nécessairement l'hématose. Le sang mal élaboré exerce sur la nutrition une influence nuisible. Baudelocque, *Maladie Scrophuleuse.*

† La condition indispensable du developpement de la maladié scrophuleuse réside dans la viciation de l'air au milieu duquel on vit. Baudelocque, Id.

santly. They happen in mines, in ships forecastles, in the lower gun tiers of men of war, in the dormitories of schools and workhouses, in prison and asylum cells. They happen to babies suffocated beneath bedclothes, or smothered in covered cradles. They happen to children and even adults who sleep on their faces or, detestable practice, with the head immersed beneath the bed coverings. In fine, they happen in the peasants cottage and the princes palace, or wherever in pent up airless sleeping or other rooms the economy is debarred of its full supply of pure, sweet, unprebreathed oxygen.

When the frightful massacre, as it may well be termed, occurred at Calcutta, the unhappy victims of Eastern cruelty pressed their poor faces to the dungeon bars, gasping begging praying for relief, till at lengh their suppliant voices were for ever stilled. Quite similarly, when the stolid skipper, instead of bringing his poor passengers into the empty cabin, aft, battened them down in the dreadful steerage, where, for all their sobs and groans and entreaties, he kept them, frightful to relate, until very many expired. Alas, the air with which they were supplied, instead of being balm and life, was converted into the venom of death. And, yet, in these, as in other instances, boundless supplies of the ineffably pure sweet unprebreathed atmosphere subsisted within but a very few inches of the miserably perishing sufferers.

No one, perhaps, will openly justify them, and yet we are all more or less guilty of like trespasses. We act in utter disregard of natures untiring prescription. We injure, unwittingly, those whom, had we the election, we should rather die to preserve. Husbands, without knowing it, destroy their wives, wives their husbands, parents their children, masters and mistresses their servants, house owners their tenants, heads of schools their pupils, ship captains their crews, commanders their soldiers, and employers, generally, their people, simply and truly by reason of barring out fresh air, leaving no alternative but the inhalation of an atmosphere more or less tainted, more or less polluted, with the irrespirable impurities of the blood. Why, the close precincts of some London barracks or stagnant dormitory, cuts off more, relatively and with greater suffering,

than did perhaps some siege of Badajos or storming of Sebastopol. If this be not true, let any one point out wherein I err. Unhappily, the evidence resides in the very life and doings of our kind.

Air saturated with respiratory foulnesses extinguishes flame, stays the bloods oxidation, induces death. Nay, an atmosphere containing two, or were it but one per cent of carbonic acid gas, the result of respiration, is also highly pernicious, arrests in its degree the bloods decarbonisation, prevents the elimination of the metamorphic waste, induces scrofula, consumption, and death. If, only, we breathe, nightly, air contaminated by the impure sordes of respiration, as in some pent up chamber or stagnant bedroom, we must perforce do, sooner or later, unless there should be much open air life and effort, and not always even then, the effete carbon fouls the blood and is laid down as tubercle within the living economy. If, however, we respire this foul prebreathed medium night and day, alike, and with no counteracting open air life and effort, as is the case with so many shut up school girls, pallid students, overwrought artisans and seamstresses, professional men and others, tubercle, in one or more of its multifarious guises, I affirm, is the sure and certain issue. The identification of carbon waste with tubercle is, I assert, the declaration of an undiscovered law, a hitherto unsuspected relation subsisting between the living organism and the outer atmosphere. It is proved to be so by observation, by exhaustive reasoning and experiment, all which demonstrate the production of tubercle in animals forced to rebreathe the same atmosphere.

The approximate annual mortality accruing from tubercle, in the form of phthisis, as induced by respiring air loaded with the detritus and exuviae of the living frame, amounts, according to my calculation, and that much within bounds,

In Scotland to some	...	...	10,000	persons.
In England to	...	...	60,000	"
In Ireland to*	...	...	20,000	"

* According to the Irish Census Commissioners, for 1841, consumption, *sgamhchnaoi, sgamhghalar, sgamhsaoth*, is the most fatal of all maladies, far more so than fever. In 1847, 8, 9, severally, almost twentytwo thousand perished, yearly, or in the three years, inclusive, sixtysix thousand persons. But, in 1850, the mortality had fallen a little below twenty thousand. Sir William Wilde, *Irish Census for* 1851. Dublin 1856, Vol. I. p. 447.

In the Scandinavian Peninsula to	20,000	persons.
In Russia to	200,000	"
In Holland to	10,000	"
In France to	100,000	"
In Switzerland to	8,000	"
In Germany to	200,000	"
And in the United States to ...	60,000	"

Still, this, immense as it is, does not include the likewise very considerable mortality springing from undetected tubercle, from the myriad forms of scrofula, from mesenteric tabes, from tubercular cerebral and spinal meningitis, and from tubercular laryngitis arthritis and osteitis. Many there be, likewise, who labour under tubercle, yet perish from accident or intercurrent maladies, and, therefore, do not swell the mortality lists from tubercular consumption, at all. But where the life of an indoor community is an indoor life by day, and their portion a stagnant prebreathed atmosphere, by night, the blood is poisoned, tubercles are generated, and phthisis, with all its attendant suffering and mortality, proves inevitable.

The laws of the living organism are simple as they are beautiful and necessary. It is their violation that leads to tubercle, and tubercle induced decay. And it is only by conforming to, and obeying, them that we shall avoid tubercle and all its devastating train. The effete carbon of the blood is not to be got rid of so long as we respire air loaded with the impure sordes, already discharged, of the living organism. And that sordes, when it is not discharged, as I must incessantly maintain and aver, at once by the logical method of exclusion as well as by direct evidence, is, demonstrably, no other than the *ipsissima materies* of tubercle. While, conversely, tubercle, itself, is the sordes in question, in a word, the metamorphic carbon of the economy. Effete carbon, then, the intercepted metamorphic waste, in short, animal sordes, is not only the *causa causans*, but, the *causa sine qua non*, of tubercle. In fine, whoso breathes prebreathed air breathes death.

As the promulgator of this great law, I have encountered the usual meed of alternate calumny misrepresentation ridicule abuse and neglect, have had to sustain attacks certainly any-

thing but conspicuous for the love of science or of truth. Each discovery elicits the jealousy of those who feel that they, perchance, might have done the same. They cannot bring themselves to pardon one who affects to eclipse the common lights. They forget the blessings which discoveries shed, the solace to universal humanity, the advantage to the common weal. Alas, in certain eyes, the simplicity and sublimity which culminate in great results, were they even to extend to the remotest posterity, are crimes for which nothing can atone. To err, indeed, is human, and, yet, even supposing I had erred, wholly, it would hardly, methinks, justify so rabid an insistency, on the part of any assailant, as certain strictures, I regret to say, do most assuredly imply, and all for having ventured to announce that rebreathed air induces tubercle, and that air not rebreathed, averts it wholly. But thus is it ever. Truths now among the clearest, and yet not more clear than is the one which I here endeavour to substantiate, have been denied.* Through what strainings and strivings, and utter denials, and vilest incrimination, indeed, did not Harvey and Jenner, for example, gain final admission for doctrines now plain to all men. And, yet, these doctrines, important and all momentous as is their bearing, in no respect surpass in importance or moment the doctrine which I announce as to the identity of the metamorphic carbon with tubercle. If, indeed, people could but discern the effete waste issue, black and dingy, from their nostrils. If, as thus, they could only see it arrested in the tissues, they would at once be convinced. And, yet, it is there, included in the breath, capable of being reduced to dark and naked carbon, some eight ounces, more or less, as emitted from the lungs within the four and twenty hours. So, when fouled air, instead of

* Toute invention trop brillante est jalousée par ceux qui pouvaient la faire. On s' indigne contre l' inconnu qui s'élève par un coup de hasard au faîte de la renommée. On ne lui pardonne pas d'eclipser tout-à-coup les lumières acquises. Un tel succes devient un affront pour la génération existante. Elle oublie les bienfaits que va donner la découverte. Chacun, avant de raisonner, veut venger son amour propre offensé. On ne jalousera guères un Newton. Les calculs sont si transcendans, que le vulgaire scientifique n'y avait aucune prétention. Mais on déchire un Colomb parceque son idée de chercher un nouveau monde était si simple que chacun pouvait la concevoir avant lui. Fourier, *Traité de l' Association Domestique Agricole.* Paris et Londres, Tome I. p. 60.

being suffered to escape, continues to be respired, the blood is no longer adequately purified, and not being expelled, or expelled sufficiently, the metamorphic waste is eventually deposited as tubercle, and nothing else than tubercle, within the living organism.

It is a natural law that when four per cent or so, of carbonic acid, the outpouring of respiration, subsists in the atmosphere, although that atmosphere still contain seventeen per cent of free or uncombined oxygen, flame if plunged into it is extinguished, and life, if brought within its evil influence, ceases. In short, the metamorphic waste, so far as the lungs are concerned, in getting rid of it, unless dispersed in the general atmosphere, and thereby rendered harmless, sooner or later, if habitually respired, puts a sure and certain end to mans existence. But if the waste be only fitly scattered and eliminated, and unprebreathed air alone respired, there is health, as *ad hoc*, and tubercle becomes simply impossible. It, therefore, rests entirely with ourselves to lessen, and in fact to exterminate, a class of maladies the most frequent and destructive of any in the world.

Climatic influences, let us be well assured, yield no immunity from, any more than they inflict, tubercle and tubercle induced maladies. If the damask cheeks of Norwegian maidens, for example*, betray signs of incipient phthisis, it is but because those poor maidens violate natures law in respect of the respiration of unprebreathed air, only. For nature, did we but fitly second her intentions, would, so far as tubercle is concerned, afford us not less security amid the icy *tundras* of Siberia than on the slopes of sunny Italy. Australian and Canadian settlers, so long as they camp out or occupy open shanties,† enjoy entirest safety. The dwellers in Arabia, living under tents, are not less secure. Pure unprebreathed air, lifes real elixir, is not less genial to us than is that *alma tellus*, in whose bosom we are one day to recline. It should be set forth, then, were it in letters of adamant, that it is the stagnant rebreathed atmosphere alone that induces, or can possibly induce tubercle. If, indeed, you breathe the open air with safety by

* *The Oxonian in Norway*, p. 356. † Sean tigh, Irish.

day, *à fortiori*, the body being sufficiently protected, for it is always summer beneath the bed coverings, you can breathe it with equal safety by night. To escape tubercle, utterly, it is but needful to maintain the indoor atmosphere, in respect of purity and unbreathedness, on a perfect equality with the atmosphere outside. For if that be not done, nothing is done.*

It seems strange, then, does it not, that at our very doors, and in close contiguity to populations that so greatly suffer, there should subsist a tract, I refer to the Hebrides and West Highlands of Scotland, wherein consumption and scrofula, else so frequent, are, in fact, unknown.† To what happy circumstance, shall we say, is this so fortunate immunity owing. How intelligent, it will be alleged, are the inhabitants, how submissive to natures wise prescription. And, yet, they are a simple race, hardly conscious of their great good fortune, which they did not seek after in the very least. It came upon them, without their knowing or looking for it, all unawares. These Western Highlanders and Islanders, then, dwell in houses of but a storey high, chinky, loosely constructed, chimneyless and ceilingless, with a hole in the roof, and a door open day and night and always. A peat fire on a raised central hearth burns ceaselessly, maintaining an ever upward current, with as incessantly a renewed and perfectly unprebreathed an atmosphere. In short, the fire is never quenched, and the roof vent is never closed. And since they thus inhale a medium free from all and every respiratory impurity, so do they of necessity enjoy completest freedom from all and every tubercular infliction. Thus, then, the carbonaceous waste being burnt off, cannot be deposited within the living tissues. If there be anything more cogent or convincing in the way of proof in this world, I am sure I do not know it. Yet, will it be believed, this so wondrous immunity has been ascribed to peat reek, just as if peat reek and tubercle did not abundantly subsist, together, elsewhere. These infinitely fortunate Highlanders and Islanders, then, are the only people in Britain, nay, perhaps, in Europe, exempt, wholly, from the kindred scourges of consumption and scrofula, all through bare com-

* Nil actum reputans si quid superesset agendum.

† *Report* of the Registrar General of Scotland, Dr. Stark, 1861.

pliance with natures law, and the avoidance, however unwitting, of an atmosphere, any portion of which has been prerespired.

Let us, then, only try to imitate these favoured Highlanders and Hebrideans, and breathe, as they do, no air that has been breathed before, whether by man himself or the creatures that are submitted to his control. Then, should we, too, secure for ourselves a mighty benefit, secure it for the world. But, this, we can only do by the fullest recognition of a law that nature, everywhere, would we only permit her, tries continually to enforce. Surely it cannot be the divine intention that men should perish off the earth like flies. What an epoch would it not then prove in the annals of our kind were we only to initiate so fair a crusade against human misery, a crusade not to inflict but to mitigate suffering. There are enough of unavoidable, why should there be any avoidable, inflictions. Now, consumption and scrofula, with every form of tubercular disease, I affirm and declare, are entirely avoidable. To oppose remediable ills is to side alike with God and nature, nay, it is of the very essence of duty to do so. And I am assured of the universal recognition, one day, of the all momentous truth, that tubercular are no other than carbonaceous deposits, and that to avoid them at once and for ever, it but needs the universal adoption of the wise precaution of only respiring an atmosphere quite unfouled with the vile products of respiration.

I have earnestly tried to diffuse rational views on the subject of tubercular disease, but it is a Sisyphian task. And, yet, the appreciation of the production of tubercle comes within the scope of every intelligence. A prebreathed atmosphere it is, which is the sufficient reason of foul blood and consequent tuberculosis. It may be shown on any animal. *Fiat experimentum in corpore vili.* Alas, the mad usages of modern life inflict this disastrous consummation on multitudes deserving of a better fate. Let it, then, prove our nobler task to urge compliance with natures too long frustrated laws, to liberate the helpless and the suffering, and to avert an infliction which neither the economy of God nor mans necessities render inevitable.

FIFTY APHORISMS, IN RESPECT OF TISSUE METAMORPHOSIS, AS ILLUSTRATING THE PRODUCTION OF TUBERCLE.

Read before the Glasgow Medical Society, March 1, 1864.

I. A ceaseless process of integration and disintegration goes on amid the living organism to which we apply the term tissue metamorphosis.

II. Of this metamorphosis there are two kinds, one direct the other retrograde, one the integration the other the disintegration of the living frame.

III. Direct metamorphosis is the formation of living tissue, of blood, of bone, of nerve, of flesh.

IV. Retrograde metamorphosis is the disintegration, after vital action, of living tissue, of blood, of bone, of nerve, of flesh, and its conversion, through the medium of the blood, into interstitial or metamorphic waste.

V. Food supplies the ingredients of the one, the used tissues constitute the material of the other.

VI. The process of integration and disintegration, of synthesis and analysis, sometimes quick at others slow, according to the requirements of the organism, subsists ceaselessly.

VII. At least tissue metamorphosis, otherwise stuff change, intermits not during life. When it does intermit it is death,* the death not of a portion, merely, but of the entire organism.

VIII. Death then, simply, is nothing else than the cessation of tissue metamorphosis while, conversely, the cessation of tissue metamorphosis is death. They are, virtually, two forms of expression for one and the same thing.

IX. Waste and supply are, mainly, though not always, coequal. If, however, the waste do not correspond with the

* Im lebenden Körper keinen Zustand der Ruhe im physiologischen Sinne giebt den das wäre der Tod. Pettenkofer u. Voit ueber die Producte der Respiration des Hundes bei Fleischnahrung, *Annal. d. Chem. u. Pharm.* II Supplementband. Heft, Leipzig u. Heidelberg, 1863.

material supply, and the material supply correspond with the waste, disease or death must, in no long period, sooner or later follow.

X. In the living frame it is in some wise as with a lighted candle. Carbon and hydrogen, in one case as in the other, are burnt off, that is to say, are converted into water and carbonic acid, through the instrumentality of oxygen, coupled, indeed, with that of the vital principle.

XI. The organism, so far as the oxidation and elimination of the effete carbon and the effete hydrogen are concerned, is thus, as it were, a living flame, and consumes, as thus, slowly away.

XII. Were the material of the candle only replaced, as in the life of the body the body is replaced, as it burns, the comparison between the candles combustion and the combustion which goes on in the living organism would be yet closer than it is.

XIII. Thus, if a plate be placed over flame so as to intercept in a measure the action of the atmospheric oxygen, the unburnt carbon will be precipitated. It is precipitated simply because it is not oxidised. Now, air that has been respired in part, before, when again respired, lessens the natural oxygen supply, and the unburnt carbon, in the guise of tubercle, is also precipitated in the living tissues. It is, also, precipitated, simply because it is not oxidised. The illustration, in all or almost all respects, is perfect.

XIV. Perfect combustion and perfect elimination of the interstitial carbonaceous waste, involve a full supply of uncontaminated oxygen.

XV. The metamorphosis of tissue, otherwise, may be a healthy metamorphosis or an unhealthy metamorphosis. If it be a healthy metamorphosis, the entire interstitial carbonaceous waste will be burnt off. If it be an unhealthy metamorphosis, the entire interstitial carbonaceous waste will not be burnt off.

XVI. In any and every case the new material must replace, healthily, the old material.* But there can be no healthy sub-

* Caro animata cur vivit et non putrescit ut mortua, quia quotidie renovatur. Ars Sanctorii Sanctorii, *De Statica Medicina*. Ferrariae 1713, Aphorismus 80.

stitution of new material for old material if the oxidation be insufficient.

XVII. The new material assumes the aspect, the mould of the old, and so continues to do while life endures. But if dead material, otherwise tubercle, be foisted in along with the new material, the process will be a diseased one.

XVIII. The body, at least as regards the material, is never really any older, any younger, than on the first day. It is in aspect and arrangement only, that decrepitude in virtue of invisible forces that we can only very partially control, ensues.

XIX. The interstitial waste, accruing from the metamorphosis of tissue, otherwise requires continual healthy elimination, else it will tend to death.

XX. In point of fact, at least in sound life, the waste or dead tissue is got rid of concurrently, or *pari passu*, with the advent of the new.

XXI. The waste carbon, and to a certain extent the waste hydrogen, is mainly eliminated through the instrumentality of the lungs. If it be not eliminated, it is death.

XXII. The waste nitrogen, the waste hydrogen and oxygen in the form of water, and the waste minerals find their principal outlet in the kidneys.

XXIII. In any case, if the direct metamorphosis of tissue do not ensue, adequately, it is death, death from inanition.

XXIV. If the waste or retrograde metamorphic tissue, on the other hand, be not got rid of adequately, it is likewise death, sooner or later death, from the retention of that waste.

XXV. Tubercle, then, with all the diseases and all the mortality, that accrue from it, is entirely ascribable to the imperfect discharge, in other words to the arrest, of the metamorphic waste. For tubercle is but the retained carbonaceous waste, while, conversely, the retained carbonaceous waste is tubercle.

XXVI. The evil results of the retention of the dead or metamorphic waste, within the living organism are only of late years, and that most imperfectly, appreciated.

XXVII. Thus various names, generally in completest ignorance of the cause, were applied to the different diseases accruing from the interception of the dead and effete metamorphic tissue.

XXVIII. It is but very recently that the nature of the maladies arising from the arrest of the waste nitrogen, for example, has begun to be understood.

XXIX. Ever since 1855, I have endeavoured to render plain to all men the evil consequences flowing from the stasis of the retrograde or waste carbon within, instead of its excretion without, the living economy.

XXX. All physicians, each and every physiologist and pathologist, are well aware of the hitherto unsatisfactory state of the pathology of tubercle.

XXXI. One supposition, one hypothesis, each more untenable than the other, has, in turns, been taken up and abandoned.

XXXII. The theory which, with all the force of conviction, I would press upon the consideration and adoption of all thinkers, inquirers, and observers is, that tubercle results from the arrest of the retrograde or interstitial carbon within the economy, is, in fact, no other than that waste or excrementitious carbon, itself, just as in certain states of the economy the waste, or excrementitious nitrogen, gathers in the blood, and is, itself, deposited as urate of ammonia, say, in the living tissues.

XXXIII. When the retrograde or waste carbon is properly expelled, there can be no tubercle nor any of the maladies, such as struma, tabes, or consumption, which owe their origin to tubercle.

XXXIV. When the retrograde or waste carbon, however, by reason of breathing the same air a second time, is retained unoxidised within the organism, tubercle is not only imminent but inevitable. For tubercle, itself, is no other than the effete carbon retained, because unoxidised, within the living organism.

XXXV. Until disabused by reason and inference, man is the slave not merely of his prejudices but of his senses. Carbon is black, but tubercle is not black, and therefore, exclaim the senses, tubercle cannot be carbon or carbonaceous.

XXXVI. But reason, guided by observation and analysis, proves, I assert, that tubercle is no other than the retrograde carbon or rather hydrocarbon, the testimony of the senses to the contrary, notwithstanding.

XXXVII. If, indeed, tubercle were scattered in dark masses through the organism, every apothecaries boy, every child, might exclaim, nay, but tubercle is carbon. Ah, if people could only discern these results, could but descry the foulness in air as they detect it in water, they would be unwilling to respire the one as they now are to imbibe the other.

XXXVIII. It does not, however, signify in the very least whether tubercle be black, or white, or yellow, since colour is in nowise essential to its identity with the unoxidised carbonaceous waste.

XXXIX. Thus, effete carbon is not the less effete, not the less tubercle, because it is not black. For black is but one of the casual protean aspects of carbon, and as a colour is no more essential to it than white.

XL. In fact, we have carbon black, as in plumbago and charcoal, white as in chalk, transparent as in the diamond carbonic acid and the breath, incarnadine, as in flesh and blood.

XLI. That translucent beautiful product, a wax or paraffine candle, is but a hydrocarbon mass. That rounded or flattened or diffused substance named tubercle, which destroys so many, is no more.

XLII. Carbon, indeed, is brilliant, as in flame. It is red, as in blood. In fine, it wears every aspect, its compounds assume every hue.

XLIII. If, as already stated, the oxygen supply be in part intercepted, in other words, if the air be deoxygenated, carbon will be precipitated from the burning taper. Soot will then form, and soot will be deposited. Even air loaded with but two one thousand parts of carbonic acid gas, as derived from respiration, becomes oppressive and of evil odour,* leads to the deposit of tubercle, the soot of the organism, the soot that accrues from defective oxidation and imperfect respiration, clogging the minute air vessels and the organism, generally.

* Der längere Aufenthalt in einem Raume dessen Luft in Folge der Respiration und Perspiration von Menschen zehn tausendtheile Kohlensäure enthällt, wird jedem fast unerträglich werden. In der schlechtesten Luft der Gefängnisse, Kasernen, Schulen, Hörsäle, und Kneipen habe ich nur selten zehn Tausendtheile Kohlensäure gefunden, und sobald die Luft mehr als zwei tausendtheile Kohlensäure enthielt, wurde schon sehr deutlich ein unangenehmer Geruch und ein lästiges Befinden wahrgenommen. Pettenkofer, über die Respiration, *Annalen der Chemie.* Supplementband. Heft I, Leipzig 1864.

XLIV. It is the same then I aver, *mutatis mutandis*, in the living frame. Air fouled with carbonic acid gas, the product of respiration, if but to the extent of ten one thousand parts, and otherwise deficient in oxygen, arrests, in its degree, the combustion of the carbonaceous waste, and causes it to be deposited, the exact analogue of soot, within the living tissues.

XLV. The whole process, only rescued from the immediate dictates of the unreasoning senses, is as simply intelligible as a sum in arithmetic or a problem in Euclid. The most elementary physiological knowledge, if only so applied, would suffice to render it intelligible to all.

XLVI. The senses, unless when guided by reason and analysis, do not show that our wax taper is a hydrocarbon, and that the diamond is no other than a transparent lump of coal.

XLVII. In like manner, the senses, unless similarly aided, do not inform us that tubercle is but a hydrocarbon, the very carbon, the very hydrogen, which the disqualified lungs, disqualified by reason of breathing the impure products of respiration, fail to eliminate.

XLVIII. If we take a glass vessel filled with carbonic acid, derived if we please from the breath, it is clear as the skyey ether. But only bring it into contact with a fragment of incandescent sodium or potassium, and, lo, the swart carbon is, forthwith, more or less precipitated.

XLIX. Now, air already respired, when respired afresh, also precipitates carbon, not black, indeed, yet not the less carbon or carbonaceous, within the living organism, that metamorphic carbon which the blood which it fouls has otherwise failed to get rid of, and, which, in our ignorance as to its real nature, hitherto, we have termed tubercle.

L. This carbon thus derived and thus precipitated, combined indeed with hydrogen and, when calcified, more or less copious traces of mineral waste, is indeed no other than tubercle. Conversely, tubercle is the precipitated interstitial carbon, the very, the effete carbon of the blood, which it renders and leaves impure, the carbon of the effete tissues, in fine, the unoxidised hydrocarbonaceous waste.

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THE END.