Thoughts on pulmonary consumption; with an appendix on the climate of Torquay / [William Herries Madden].

Alfred Crosby Pope, M.D.

THOUGHTS

ON

PULMONARY CONSUMPTION,

&c. &c.

THOUGHTS

ON

PULMONARY CONSUMPTION;

WITH

AN APPENDIX

ON THE

CLIMATE OF TORQUAY.

BY

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JOHN FORBES, M.D. F.R.S.

PHYSICIAN IN ORDINARY TO THE QUEEN'S HOUSEHOLD, AND PHYSICIAN EXTRAORDINARY TO THE PRINCE ALBERT.

My dear Sir,

It is with no little pleasure that I avail myself of your kind permission, that I should honour my little book by inscribing it with your name.

To say that I have derived much advantage from your writings, is merely to add my testimony to the universal verdict of the Profession, which has long regarded you as one of the most successful cultivators of our Science, and as one of those who have done most to elevate the standard of Medical Literature. But I have more to acknowledge than this; for I can speak of many acts of personal kindness,

and of valuable counsel and encouragement received at your hands.

That you may be long spared to tread that useful and honorable path on which you have hitherto walked, is the sincere wish of,

My dear Sir,

Your faithful and obliged friend,

W. H. MADDEN.

TORQUAY; *Jan.* 1849.

PREFACE.

A FEW words appear to be necessary, in order that the nature of the following work may be clearly apprehended at the outset, and that my readers may not be disappointed, by seeking in its pages what it is not intended to contain.

It has no pretensions to the character of a systematic dissertation on Phthisis. The unapproachable Researches of Louis, the classical Treatise of Sir James Clark, and the admirable Article of Dr. C. J. B. Williams, are, each in its own particular way, so perfect, that to attempt another would be an effort little likely to succeed. I have not aimed so high; and, therefore, if I fail, the fall will be, at any rate, less great.

And yet it is not a mere congeries of disjointed Thoughts. One leading idea will be seen to run through the whole; and, if I mistake not, each successive portion, however irrelevant some may at

first sight appear, will be found essential to the integrity of the argument which I have laboured to sustain.

That argument regards the *true substantive nature* of Phthisis; and this I have endeavoured to elucidate by a comprehensive view of the phenomena presented by the disease itself, and by the diathesis which precedes its manifestation; attempting to form a consistent picture of the whole, to show by what links the separate parts are connected, and to demonstrate *why* the results are what our investigations prove them to be.

It is quite apparent that, with this definite object before me, it was altogether unnecessary to dwell upon many points, which in a systematic work would have claimed especial notice; and that some, which might, under other circumstances, have been lightly passed by, would demand a close and rigorous attention. Accordingly, I have given no minute descriptions of the pathological conditions of phthisical lungs, which are discoverable by the naked eye, being contented with the broad features of distinction which discriminate between the sthenic and the asthenic forms of the disease. I have said little of the special varieties of phthisis, and have not delayed in considering peculiar modifications of

symptoms, excepting in so far as they were illustrative of the grand object of research.

On the other hand, I have entered more fully than is usual into the consideration of the Chemistry and Histology of Tubercle, have examined with some minuteness the condition of the Blood in Phthisis and in Scrofula, and have devoted considerable space to the great subject of Nutrition, as carried on in health, and as modified and impeded in the particular disease before us.

I have also traced out, and that with some minuteness of detail, the analogies which exist between tubercular and many other diseases, all of which appear to me to have their origin in the same class of causes, viz. Morbid Poisons; and have endeavoured to show that, by the adoption of this hypothesis, we can give a more natural and more satisfactory explanation of the phenomena than is possible upon any other supposition.

And, lastly, I have striven to demonstrate the way in which our remedies act; to prove that the beneficial results obtained from their administration are in strict accordance with their own essential nature, and with the pathological conditions here presumed to exist; and to lay down rules for the rational treatment of consumption.

Some of these points have been already brought before the notice of the profession, in a paper communicated to the 'London Medical Gazette,' in 1847.

I can scarcely hope that my views will meet with universal assent, and am quite aware that to some I may appear too theoretical. But I venture respectfully to ask for a candid consideration of the argument *as a whole;* and would merely submit, in conclusion, that a theory becomes a practical matter when, as in this instance, it has a direct bearing upon treatment;—that we must have a theory, if we wish to comprehend the realities of any disease; and that if phenomena observed by those who have no special views to support tally with the requirements of such theory, we have, in that very fact, no slight grounds for believing that it must contain the germ at least of truth.

Torquay; *Jan.* 1849.

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PART I.

CHEMISTRY, HISTOLOGY AND PHYSIOLOGY

OF

TUBERCLE.

SECTION I.

PRELIMINARY OBSERVATIONS—SKETCH OF SUBJECT.

To treat diseases by their symptoms alone, is little better than empiricism. To imagine that we are acquainted with the *essence* of a disease, because we know and can recognise in the dead subject, the abnormal changes to which it gives rise, is a common delusion, by which numbers have been arrested in their inquiries after truth. And from these two sources of error originates a large proportion of the uncertainty and vacillation of medical practice.

We must know symptoms thoroughly, or we shall inevitably make grievous mistakes in diagnosis. It is necessary to be well informed of the structural changes which occur in disease, or we shall fail in the right interpretation of symptoms. But if we would arrive at a true acquaintance with the actual state of morbid processes, we must go much further than this. We must investigate causes: we must inquire into the vital forces which are brought into play for the production of the results we witness; and when new substances are formed,—in other words, when there are morbid deposits,—we must ascertain, as far as may be, the intimate structure, the true essential nature of these abnormal entities. And then, com-

bining in one general view our reasonings and our discoveries, we must seek to form a connected and consistent picture of the whole; and, remembering always that we have to deal with a living and most complicated organism, must study to apply such remedies as will meet the various exigencies of the case; subduing inordinate action, stimulating that which is defective, and altering that which is unhealthy or perverted. It is in this way only that we can practise with that well-grounded confidence, which is the best omen of success; and thus only shall we escape from the miserable uncertainty, which is so large an element in professional anxiety.

There are few diseases to which the above remarks apply with more force, than to that which is to form the subject of our present inquiries. Witness the endlessly conflicting opinions; the host of useless specifics; the marvellous cures of what was never consumption; the artificial emphysema, which, if ever produced, would only render the deluded patient more miserable, without in the smallest degree relieving him of his disease; the hazardous expedient of cutting down upon tubercular abscesses, in the vain hope that the walls of the cavity would thus collapse, and the ulcer be healed. These things would not be, if the course above indicated were more generally adopted; they must continue to encumber and deform the records of medicine, so long as parts are mistaken for the whole, and theories are based upon insufficient data.

To arrive, therefore, at a correct appreciation of the

true nature of pulmonary phthisis, it is not enough that we are acquainted with the signs and symptoms of its various stages, nor that we can recognise the alterations of structure revealed by microscopic investigations: these are essential portions, but not all, of the knowledge required. And even these, if they are to teach us anything, must be viewed in combination. Attention to symptoms alone will lead us into frequent errors; we may mistake a mere chronic bronchitis for the more serious phthisical disease, and thus inflict the tortures of undue apprehension; or, *vice versa*, we may deceive ourselves and our patients with the hope of a permanent cure, when the lungs are extensively and irretrievably damaged. Undue reliance upon signs is almost equally dangerous; and both together are of little worth, unless we are instructed in the physical changes to which they owe their origin.

Still, however accurately these things may have been observed, and however skilfully arranged in our minds, they will not secure us against the most injurious mistakes, nor lead us to correct and scientific practice, if we stop short at them and push our inquiries no further. In examining a tuberculated lung, we very often find unmistakeable evidences of inflammation, and many practitioners, seizing at once upon this fact, and omitting all investigations into the essential nature of the new formation, have immediately sprung to the conclusion, that tubercle is in every instance the product of inflammatory action, and that the antiphlogistic plan is the true and only

method of cure. How vain have been their dreams, let sad experience testify!

It is perfectly clear that we must learn what tubercle really is, if we would adopt correct views of the disease of which it is the great characteristic; and further, we must understand the state of the system which leads to its deposition, before we can hope to arrive at right principles to guide our therapeutic efforts. How is this to be done? The mere scalpel of the anatomist will not suffice; for though by it we obtain most valuable information,—though we ascertain the position which tubercle occupies in various organs, the relative frequency with which it attacks the different viscera, the changes which it undergoes in itself, and to which its presence gives rise in the parts which are its seat, we do not thus discover its nature, nor perceive clearly how it differs from other morbid products. We must apply higher methods of analysis; we must investigate its intimate structure by the aid of the microscope, and submit it to the test of chemical analysis.

Having gone thus far, it will be necessary in the next place to ascertain whether there are any concomitant alterations in the quality of the blood, and if so, in what these consist. We must then investigate the condition of the great function of nutrition, in order to the discovery of any deviations from the normal processes which it may present, and which may account for the phenomena previously observed. We must combine these results, see how they bear upon the question at issue, and how they corroborate or

disprove what has been received of the causes of the disease. And having in this way obtained a general view of the subject, we must apply what we have learned to the explanation of the symptoms and progress of the disease, and deduce from all our rules of practice.

The task is one of no small difficulty, and the prospects of entire success are not the most encouraging; but every observer may help the cause forward a little, if only he adopt the right method; and therefore, in the hope that I shall not altogether fail in elaborating somewhat that may be practically useful, I would invite attention to the following pages, which exhibit what much thought has led me to regard as the true rationale of that fearfully common, and too often intractable disease, Tubercular Phthisis.

SECTION II.

CHEMISTRY OF TUBERCLE.

This subject has attracted a considerable measure of attention; and though the results obtained by different analysts present some variations, there is on the whole a very satisfactory amount of agreement among them.

According to Thenard, unsoftened tubercle is composed of animal matter, 98·05; chloride of sodium, phosphate of lime, carbonate of lime, 1·85; and some traces of oxide of iron.

Hecht describes the animal matter as consisting of albumen, fibrin, and gelatin.

Preuss found 19·5 per cent. of solid constituents, and 80·5 of water; the solid constituents contained an animal matter resembling casein, a fat containing cholesterin, and a small quantity of salts. Or, more particularly, cholesterin, 4·94; fat salts of soda, 13·50; phymatin, muriate, lactate, and sulphate of soda, 8·46. Casein, with chloride of sodium, sulphate and phosphate of soda united, 7·90. Casein destroyed by heat, with albumen, oxide of iron, phosphate and carbonate of lime, magnesia and sulphur, united, 65·11. In softened tubercles he obtained the same elements, with the exception of cholesterin.[1]

Güterbock describes tubercular matter from the bronchial and jugular glands, as containing albumen,

[1] Vide Glover on Scrofula, p. 55.

pyin, phymatin, and fat. These two last-mentioned analysts are the only ones who have detected the presence of this peculiar animal substance phymatin.

Scharlau gives as its constituents, albumen, gelatin, fibrin, fat, and water.

According to Boudet, *incipient tubercles* consist of albumen, casein, a substance analogous to fibrin, cerebric acid, oleic and margaric acids, saponified fat, lactate of soda, and cholesterin. The ashes contain chloruret and sulphate of soda, phosphate and carbonate of lime, silica and oxide of iron. *Cheesy tubercles* are alkaline. When mixed with water, the solution is partly coagulable by heat. After removing the albumen the liquid gave, like milk, a precipitate with acetic acid, and when evaporated by a gentle heat, a pellicle was formed. The calcareous concretions contain 70 per cent. of the soluble salts, and only a small proportion of the insoluble.[1] This last result is entirely at variance with the observations of other chemists, and if correct, would render their long persistence, in an organ abundantly supplied with fluids, a very inexplicable phenomenon.

Simon[2] gives the following analysis of tubercular matter from a horse :

Water . . .	84·27
Fat containing cholesterin . .	1·40
Spirit extract with salts .	1·52
Caseous matter with water extract	1·14
Water extracts and salts . .	3·80
Insoluble constituents . .	4·44

[1] Bulletin de l'Acad. de Méd., quoted in the Med. Times of Nov. 2, 1844.

[2] Animal Chemistry, translated by Dr. Day, Sydenham Soc. edit., vol. i, p. 478.

The researches of Scherer[1] have been very extensive, and he has put on record several ultimate analyses which are of special use for the purpose of comparison.

Crude pulmonary tubercle he found to contain little fat or extractive matter. Its ultimate analysis, after the most careful removal of foreign constituents, gave

Carbon	53·888	which corresponds with the formula $C_{43}\ H_{35}\ N_6\ O_{13}$.
Hydrogen	7·112	
Nitrogen	17·237	
Oxygen	21·767	

Now, if we compare this with Liebig's formula for protein, $C_{48}\ H_{36}\ N_6\ O_{14}$, we see that it differs from that substance by the absence of five atoms of carbon, one of hydrogen, and one of oxygen.

Tubercular matter in the abdominal cavity, contained in 1000 parts:

Water	893·82
Solid residue	106·18
Fat	25·40
Casein and alcohol extract	12·39
Pyin and water extract	6·19
Salts	7·43
Crude tubercular matter	54·55

The ultimate analysis of this latter corresponded with formula $C_{46}\ H_{36}\ N_6\ O_{13}$, or protein from which two atoms of carbon and one of oxygen had been removed.

In this instance the liver was coated with a layer of plastic exudation, a line and a half thick, the ultimate composition of which was found to be precisely identical

[1] Simon's Animal Chemistry, note by Dr. Day, vol. i, p. 478 et seq.

with the above,—a fact of much interest, and, as we shall afterwards see, of some importance; but the *proximate* analysis showed a difference in the diminished quantity of water, fat, and extractive matters.

Water	731·62
Solid constituents . . .	268·38
Fat . . .	15·47
Water extract with pyin and casein	4·32
Spirit extract . . .	6·23
Salts . . .	5·40
Insoluble organic residue . .	237·96

Dr. Glover in his very admirable essay on Scrofula, to which reference has been already made, as affording some of the above data, has recorded the results of several original analyses of tubercular deposit, which fully bear out the general inferences to be derived from the labours of preceding chemists; but he was unable to detect casein in any of the specimens he examined.

The same author gives the following account of the constitution of organized lymph, found between the pleuræ, in a phthisical subject: "A carefully selected specimen dried, weighed 44·55 grs. This, pounded, was subjected successively to the action of alcohol and ether; the solutions obtained were mixed, and, on being evaporated, gave crystals of cholesterin; the watery extract contained no pyin; the spirituous extract was very small, but it was lost; from the weight of the protein residue, this extract could not have exceeded 1·95 of a grain; the alcoholic and etherial residue, burnt, gave 0·5 of ash; the watery extract gave 0·7; 10 grains of the dried insoluble protein basis yielded

2 per cent. of ash. The following, therefore, was the proximate composition of the lymph:

Alcoholic and etherial extracts, fats, and cholesterin	6·50
Water extract	5·90
Spirit extract and loss	1·95
Protein residue	28·40
Salts	1·80
	44·55."

It is to be lamented that both these analyses of plastic lymph, the only two which I have been able to meet with, should have been founded upon specimens taken from tubercular subjects. Careful examinations of the same substance, obtained from bodies not infected with that constitutional taint, are a great desideratum.

Such are some of the data afforded by the revelations of chemistry. What do they teach us? Do they give forth any articulate utterance; or must they, for all practical purposes, remain in the negative position of mere scientific curiosities? To answer these questions it will be necessary to dwell with a little more particularity on one or two points of the evidence brought before us.

We have seen that casein is one of the constituent parts of tubercle. This substance, like albumen, with which it is identical in composition, is one of the plastic elements of nutrition; but, like it also, is incapable of being worked up into tissue, until it has undergone a further change. Taken into the stomach it will serve the purpose of food, and thus minister to growth; but until it has been raised in the scale by higher vitalising processes, it cannot form a living ingredient of healthy

structures. Its presence, therefore, indicates defective elaboration.

Pyin, which also exists in tubercle, is a peculiar principle, first obtained by Güterbock, from pus; according to Mulder, it is identical with tritoxide of protein. Now, both the tritoxide and binoxide of protein occur constantly in small quantities in the blood, being formed by the oxidation of fibrin in the lungs; but their amount is greatly increased during inflammatory states of the system.[1] The buffy coat is formed when they predominate in the blood; when they accumulate in any part, local inflammation is the result, and we have then the evolution of morbid products, e. g. false membranes, which are found, on analysis, to be in a great measure composed of oxidized protein. The presence, therefore, of pyin would seem to indicate the existence of a certain amount of inflammation, or, in other words, as we shall see reason to believe in a subsequent portion of the work, of abnormal nutrition. In the former instance we had the evidence of defective action; here we detect marks of irregular destructive influences.

But, perhaps, what appears most palpably upon the very surface of the chemical results above narrated, is the undue preponderance of water, fat, and extractive matters in tubercle; and this, too, points in the same direction. The indefinite animal principles, to which the term extractive matters is applied, may be regarded

[1] Dr. Day's Introduction to Simon's Chemistry, vol. i, pp. 12, 13, note.

as the products of the nutrition, and waste of the different tissues. (Simon.) According to Mulder, they are composed, in part at least, of the oxides of protein. They exist in blood, bile, milk, urine, mucus, pus, and all the soft tissues, and most abundantly in muscular flesh; but even in this latter they are in smaller quantity than in tubercle, e. g. in human flesh Marchand[1] found 2·60 of extractive matters, L'Heretier 3·70; while in one of the analyses of tubercle given above, it will be seen the per centage is 6·46. This greatly increased proportion appears susceptible of two explanations. Adopting the opinion that these extractive matters, in the normal state pass unchanged into the blood, and are thrown off by the urine, in which fluid they have been detected both by Berzelius and Simon, we may look upon their presence in such large quantities, in the matter of tubercle, as a proof that the healthy process of excretion has been diminished in activity, and the substances which should have been cast out, retained in the economy. Or, seeing that it is yet undecided whether they do thus enter the blood in an unaltered condition, we may regard them merely as the result of the waste of tissues, and take their preponderance as an index of the undue activity of the decomposing forces.

And this view appears to be more correct, when we conjoin with it the evidence afforded by the fatty nature of the tubercular deposit; for it may be laid down as a

[1] Simon's Chemistry, vol. ii, p. 423, note.

general rule, that the fatty transformation of organs is a process of degeneration. Of this we have examples in the increase of oil-globules in the epithelium-cells of the kidney; in certain forms of Bright's disease, as observed by Dr. George Johnson, and others; in the atheromatous patches of arteries; in the opaque exudation-corpuscles found by Mr. Gulliver in lungs affected with low chronic inflammation, and in gangrene, which corpuscles Dr. Davy has shown to consist chiefly of olein and margarin; and especially in the formation of adipocire from animal flesh, when kept moist without access of air.[1] Mr. Gulliver states that "there are some facts in favour of the idea that albumen may be converted into oil;"[2] if further observation should prove this to be the case, it will afford additional testimony to the correctness of the above-mentioned explanation, for such change can only be effected by a retrograde motion of elements, a more complex, and more highly vitalised principle, descending into the condition of one which is altogether lower in the scale. And, indeed, this is evident from the appearance of oily matters in gangrenous parts, whatever be the substances from which it may be formed.

[1] Principles of Medicine, by Dr. C. J. B. Williams, 2d edit., pp. 373-4.

[2] Hewson's Works, Sydenham Soc. edit., p. 86, note.

SECTION III.

HISTOLOGY OF TUBERCLE.

If a small portion of pretty firm opaque tubercle be gently pressed between two pieces of glass, and submitted to the microscope, it will be seen that it is composed of an immense number of very minute granules and molecules, intermingled with corpuscles of a peculiar appearance, which lie in close approximation by their edges, and in innumerable layers. Mixed with these elements, there are fragments of the natural tissues of the lung, epithelial scales variously modified in shape, fibres and filaments of the minute vessels, &c.

On examining the corpuscles, when isolated, with a magnifying power of 470 diameters linear, I found them of considerable but variable size. The outline was well defined, though irregular, and they had an angular aspect. When moving through water, it was evident that their form approached that of an irregular polyhedral sphere, instead of being disc-like. When treated with acetic acid, they became transparent, and showed granules in their interior, and projecting through the cell-walls: but I could not detect any distinct appearance of nuclei, and am inclined to believe that they do not exist. When once their characters have been clearly made out in a disintegrated portion, they can be readily recognised *in situ*, however numerous and closely packed.

At the commencement of my observations, some little difficulty was experienced from the presence of epithelial scales, which bear a considerable resemblance to them at first sight, and I doubt not have been frequently mistaken for what I conceive to be the true and essential tubercle-corpuscle. More close inspection will remove this obscurity, by demonstrating the nucleus in the scale, and the flatness of its shape.

I tried the effects of several reagents upon these corpuscles, but without arriving at any very remarkable conclusions. Their transparency is increased, after a time, by a concentrated solution of iodide of potassium, but there is no change of shape and no development of nuclei. Some, treated in this way, were marked by minute and very black spots, which had not been visible before. Could this be the result of some chemical action on the granules contained within the cell-wall? Or was it merely that pigmentary matter, before unseen, was now brought to light by the change in the other parts of the corpuscle? The separated molecules were rendered so transparent as to be scarcely visible.

When floated in pure naphtha they have a striking mulberry-like appearance; this aspect being caused by rounded prominences of the cell-wall. Some of them gave the idea of being about to split up into molecules, like those which form the great mass of the tubercle. Naphtha is an excellent medium for observing the corpuscles, their general contour and appearance being rendered peculiarly distinct by it.

Tincture of iodine produced no change, beyond that of coloration. They are completely dissolved by liquor potassæ.

When softening has taken place, the corpuscles are disintegrated and less numerous. According to Dr. Bennett's observations, softened tubercle is sometimes wholly composed of granules or molecules.[1] In this stage, I have generally found a number of free oil-globules, and many crystals of cholesterin.

Lebert (whose account of the microscopic characters of opaque cheesy tubercle precisely coincides with what I have above narrated as seen by myself) describes the gray, semitransparent granulations of the lungs, as distinguished by the increased quantity and increased transparency of the inter-corpuscular substance, and the greater number of pulmonary fibres. On the other hand, Dr. Addison of Malvern,[2] and Mr. Gulliver,[3] are of opinion that their peculiarity consists in the great relative amount of granulated vesicles.

Cretaceous tubercles are made up of masses of earthy salts, of irregular form and size, often mixed with crystals of cholesterin and pigmentary elements.

It appears from the researches of Lebert[4] and Addison, that the usual seat of tubercle in the lungs is the intervesicular areolar tissue; but in some cases they are deposited in the air-cells, or the capillary bronchi.

[1] Edinburgh Monthly Journal, June 1846, p. 434.

[2] Experimental Researches, Trans. Prov. Med. and Surg. Association, vol. xi, p. 288.

[3] Appendix to Gerber's Anatomy, p. 87.

[4] Edinburgh Monthly Journal for 1844, p. 897.

This is quite at variance with the view so ably advocated by Dr. Carswell, who regards the tubercular deposit as a secretion from the free surface of the mucous lining of the air-passages: nevertheless, I believe it to be the most correct, and conceive that the celebrated pathologist just named, was led into error by neglect of histological investigation. Any one who has endeavoured to make out for himself the minute anatomy of the lung, will be easily convinced that the figure he has given of the extreme ramification of the bronchial tube, and the terminating vesicles filled with yellow tubercles, is not a representation of the true structure. Dr. Carswell follows Reisseissen in his anatomical descriptions. I have many times sought, but always in vain, for the objects he depicts, and in this I am borne out by the more extensive experience of Dr. Addison; I could never find anything more marked than a slight expansion of the extremities of the tubes.

In advanced stages of the disease, all the textures of the lung appear to be implicated; a section has an almost homogeneous appearance, and it is only here and there that we find traces of the normal structure, and can discover the faint outline of the air-cells.

Such is the minute anatomy of a tubercle. We see that it is far from being a mere congeries of amorphous particles, that it has a true, definite structure of its own, an organization, if we may use the term in a somewhat modified sense, by which it may be known in whatever locality it is found, and by which it is distinguished

from all other deposits of what nature soever. And it is equally clear that the presence of peculiar corpuscles constitutes its essential characteristic. What then are these corpuscles? Dr. Addison regards them as abnormal epithelial cells, and draws several analogies between phthisis and various cutaneous diseases. The analogies may hold good in some respects, and be not without practical usefulness; but the proof of identity appears to me altogether defective. Epithelial cells are nucleated; tubercle-corpuscles are devoid of nuclei. Here is an insurmountable obstacle on the very threshold. Dr. Addison may affirm, that the absence of the nucleus is the abnormal condition to which he refers; but this would be a self-evident *petitio principii*, an assumption of the very thing to be proved. The same objection is fatal to the opinion, once current, that tubercle is nothing more than concrete pus, for acetic acid demonstrates the granular nucleus of the pus-corpuscle, while it shows no such internal arrangement in the tubercle body. Its smaller size, irregular shape, and the absence of primitive filaments, in like manner, separate it from plastic corpuscles. It can scarcely be confounded with the exudation-corpuscle, for that is much larger, of a brownish or blackish colour, and nucleated. And lastly, the cells of cancer are large, transparent, and with most distinct nuclei. We are, therefore, shut up to the opinion, that it is a body *sui generis*, which belongs to this peculiar morbid deposit, and to this alone. I shall afterwards endeavour to show that its presence is the uniform result of the

operation of one special cause, that on no other principle are the phenomena of the disease we are considering susceptible of a consistent explanation; and that analogical inductive reasoning would lead to the same conclusion, as now results from positive observation.

For instance,—a lymphatic gland, in a healthy man, becomes inflamed as the result of some irritation, simple or specific; an abscess follows, the matter is discharged, and the part recovers its normal condition. A like series of events takes place in a tubercular gland, and we have a sinus which resists all our efforts to heal.

To the inflamed skin that covers a non-malignant tumour, we apply leeches for the relief of the engorged vessels, and we gain our point. Follow the same plan with a malignant growth, and, in all probability, the bites will become the seat of incurable ulcerations.

A patient is affected with tubercular disease of a joint; the limb is removed, and some time after, to the great disappointment of the friends, he dies of pulmonary consumption, and the lungs are found full of the same deposit, which had been previously discovered in the amputated bones. Another presents himself with a carcinomatous tumour involving the extremity of one of the long bones. As a last hope, the leg, or arm, as it may be, is cut off. But the effort proves futile, and after no long period he succumbs to his malady, and his lungs, or his liver, or some other internal organ, are seen crammed with secondary carcinoma.

Why should there be any variation in the principles

which guide us in explaining these phenomena? Why should we believe that the untoward events observed in the one set, are connected with the specific nature of the microscopical elements of the cancer-growth, and deny the existence of analogous (I do not mean similar) inherent properties in the tubercle-cells? There is unquestionably a difference, and a marked one, between the two cases. Cancer-cells have, as an essential part of their constitution, the faculty of reproduction; they are, in fact, nucleated bodies, which continually and spontaneously generate an indefinite number of successors; and it is thus the tumours which they form, grow and increase; and thus, too, the disease spreads through contiguous textures. Of tubercle-corpuscles we cannot affirm the same things: they are anucleate; and, as far as we know, are utterly incapable of originating any descendants. But this fact does by no means invalidate the argument, that the fountain of the two diseases is alike a vitiation of the blood, and that the phenomena presented by both are what they are, simply because the morbid elements have a certain determinate, and altogether specific character; or, to speak with more strict correctness, because the vitiation on which they depend, is, in each, peculiar and distinct from all other morbid changes.

We must now, therefore, advance another step in our inquiries, and endeavour to ascertain whether there be any cognisable alteration in the qualities of the blood in phthisical subjects, and if so, in what these consist.

SECTION IV.

STATE OF THE BLOOD IN PHTHISIS.

The researches of modern chemists have conclusively shown, that a considerable amount of variation in the relative proportion of the principal ingredients of the blood, is not incompatible with the persistence of good health. It is, therefore, by no means an easy task to obtain a correct standard for the purpose of comparison; and the difficulty is increased by the perplexing fact, that different methods of analysis present us with somewhat varying results. Accordingly, if we contrast the healthy standard of one observer, with the analysis of diseased blood obtained by another who has followed a different process of investigation, our conclusions will be based upon data that are not altogether trustworthy. In the subjoined sketch, I shall endeavour to avoid this error as much as possible.

The variations compatible with health are well seen in the following table, which exhibits the general results obtained by Denis :[1]

	MALE.		FEMALE.	
	Maximum.	Minimum.	Maximum.	Minimum.
Water .	805	732	848	753
Albumen	63	48·5	68	50
Globules	186	110·5	167	71·4
Fibrin .	4	2	3·1	2

[1] Carpenter's Physiology, 2d edit., p. 511.

This table shows also that there is a normal difference between the blood of the two sexes, the female containing more water, and less of the solid constituents, excepting the albumen, of which there is a trifling excess. This fact, too, requires to be carefully noted, when we are considering the effects of morbid processes.

Simon[1] gives the following as the composition of healthy blood, as deduced from the mean of his analyses:

Water	795·278
Solid residue	204·022
Fibrin	2·104
Fat	2·346
Albumen	76·600
Globulin	103·022
Hæmatin	6·209
Extractive matter and salts	12·012

Contrast with this the two following analyses of the blood of two phthisical patients, both males:[2]

Water	807·500	825·200
Solid residue	192·500	174·800
Fibrin	4·600	6·500
Fat	2·350	4·200
Albumen	98·360	90·350
Globulin	71·230	61·110
Hæmatin	3·110	2·690
Extractive matter and salts	9·350	8·000

The blood in the first of these analyses was taken from a man aged 36 years, in the second stage of the disease; that of the second from a man aged 41 years,

[1] Simon's Animal Chemistry, vol. i, p. 245.

[2] Ibid., p. 280.

in the third stage, and who suffered severely from nocturnal colliquative sweats, and from feverish symptoms. In both there is a decided increase of fibrin, with a diminution of the hæmato-globulin, and generally a smaller quantity than natural of the solid constituents.

The results obtained by Andral and Gavarret are in a great measure analogous to the above, as is shown by the table below, which gives the maxima, minima, and average of the various constituents, as deduced from twenty-two analyses, and also that important element of comparison, their standard of healthy blood :[1]

	Water.	Solid residue.	Fibrin.	Corpuscles.	Solid residue of serum.
Maxima . .	845·8	225·0	5·9	122·1	105·4
Minima . .	775·0	154·2	2·1	76·7	65·1
Mean . . .	809·7	190·3	4·4	100·5	85·3
Healthy blood	890·0	210·0	3·0	127·0	80·0

It is to be regretted that we do not know the sexes of the individuals who afforded the materials for these calculations, and are equally unenlightened as to the progress disease had made in the various cases, and also with respect to the presence or absence of inflammatory action. The last is of special importance, because there is no morbid process which exerts a more marked or decided influence on the condition of the blood.

Becquerel and Rodier[2] examined the blood of nine phthisical subjects, viz. five men and four women.

The following table shows the mean composition of

[1] Simon's Animal Chemistry, vol. i, p. 281.

[2] Ibid., pp. 235, 281-2.

the blood of the men, as compared with the healthy standard of the same chemist:

	In phthisis.	Healthy blood.
Water	794·8	779·0
Solid constituents . .	205·2	
Fibrin	4·8	2·2
Fat	1·554	1·60
Albumen . . .	66·2	69·4
Corpuscles . . .	125·0	141·1
Extractive matter and salts . .	7·7	6·8

Of the four women:—

	In phthisis.	Healthy blood.
Water	796·8	791·1
Solid constituents . .	203·2	
Fibrin	4·0	2·2
Fat	1·729	1·62
Albumen . . .	70·5	70·5
Corpuscles . . .	119·4	127·2
Extractive matter and salts . .	7·6	7·4

Dr. Glover[1] very correctly remarks, that "analyses of the blood in phthisis are obviously much less instructive of the real character of the alteration which takes place in this fluid, than are those which can be made in scrofula, or mere external tubercle, on account of the great debility and cachexia, arising from obstruction of the more important functions, present in the internal scrofulous diseases." Nevertheless, the results of his own investigations into the condition of the blood in external tuberculosis, correspond very closely with those above narrated; and as the method of analysis which he adopted, in the majority of instances, was the same as that employed by Andral and Gavarret, we have the

[1] Essay on Scrofula, p. 117.

power of comparing them with the healthy standard of those chemists, already noted.

The means he thus derived from the blood of eleven scrofulous males were,[1]—Solids, 208·05; Fibrin, 3·132; Solids of serum, 87·60; Corpuscles, 117·32.

The means from six women were;[2] Solids, 203·845; Fibrin, 3·585; Solids of serum, 85·28; Corpuscles, 114·88.

On reviewing these different statements, we observe at once that, although there is some variation in the absolute results, the general principles which may be deduced from the analyses are the same in all. We see that the solid constituents, taken as a whole, are below the standard of health; that the fibrin bears a notably increased proportion; and, above all, that there is a very marked and constant diminution in the amount of the corpuscles. We shall be better able to decide upon the value of these several conditions, when we have gone through the subject of the next section.

[1] Essay on Scrofula, p. 109. [2] Ibid., p. 114.

SECTION V.

STATE OF NUTRITION.

The researches of modern physiologists have, I think, conclusively shown, that the organic constituents of every part of the animal body have an individual life of their own; i. e. they are placed in their proper destined locality,—grow,—attain full maturity,—perform certain definite functions,—decay,—die,—and, after yielding up a portion of their substance, which is still capable of re-assimilation, are finally thrown off as useless matter, the removal of which is essential to the well-being of the living whole. These depositions, active workings, decline, and rejection, are carried on in an endless circuit, so long as the animated frame, which is their theatre, retains its faculties unimpaired. They are all formed at the expense of the blood; and to meet such constant, never-ceasing demands upon that fluid, a regular supply of proper food is absolutely requisite. Diminish the quantity, or impoverish the quality of this food, and sooner or later, as an inevitable consequence, nutrition fails.

But this does not complete the picture of mutual dependence, so strikingly illustrated in the animal economy. We may have the full and right provision constantly afforded, all the material elements for the

construction of good blood; but the living solids may be impaired in their powers of selection and appropriation, and then the same result follows: we have still mal-nutrition. And this abnormal process may go on, perpetuating itself indefinitely, and with ever-increasing completeness of aberration, until the entire frame fall into decay, or death, or art step in to purify the fountain of such evil. This is what we witness, more or less, in all diseases that are not purely local in their effects, and notably in that one which we are now engaged in studying.

It is, therefore, self-evident, that a correct understanding of the nature of healthy nutrition, is altogether essential to the scientific appreciation of the phenomena of tubercular consumption; a disease which, as its very name implies, is characterised by *wasting*, the antithesis of *nutrition*.

The most simple division of alimentary matters, is that adopted by modern chemists, which arranges them into two groups,—the azotised, and the non-azotised; and of these two, albumen and oil may be taken as the types. The function of the stomach and intestines appears to be to separate these proximate principles from the compound mass, which is introduced from without, and to reduce them to such a condition as will permit of their absorption. In the stomach the food is resolved, by the chemical action of the gastric juice, into that soft pulpy substance which is known by the name of *chyme*. This passes, as it is formed, through the pyloric orifice into the duodenum, slowly

at first, but afterwards in considerable quantities. It is here mixed with the biliary and pancreatic secretions, and undergoes important changes. From Dr. Beaumont's observations,[1] it would appear that by this admixture the chyme is separated into three distinct parts,—a reddish-brown sediment at the bottom—a whey-coloured fluid in the centre—and a creamy pellicle at the top. The sediment is excrementitious matter, which is increased in quantity and acquires its proper fæcal character as it passes along the intestinal canal, by the addition of the proper secretions of the glandulæ of the enteritic mucous membranes, whose office it is to separate putrescent particles of decomposed tissue, from the current of the circulation. The whey-coloured fluid is probably the true chyle; while the creamy pellicle constitutes the fatty matter which is found in the contents of the lacteals.

Being thus, as it were, set free from impurities, and moving slowly along the surface of the mucous membrane, the truly nutritive portion of the food is absorbed by the lacteals. These vessels, the lymphatics of the intestines, commence in the villi, which are chiefly composed of a minute plexus of capillaries, and very delicate areolar tissue. It is certain that they do not open by free orifices, as was formerly supposed; and Mr. Goodsir[2] has shown that the villi themselves are inclosed in a very delicate membrane, analogous to that which lies under the epidermis and epithelium in the

[1] Carpenter's Physiology, p. 381.

[2] Edin. New Phil. Journal, July 1842, quoted by Carpenter, p. 394.

skin and mucous membranes; and that, when digestion is not going on, they are covered by an epithelium. The same eminent anatomist has also discovered a very interesting provision in these minute organs, and one which tends to throw considerable light on the subject of nutritive absorption. "The space between the reticulations of the blood-vessels and lymphatics, towards the extremity of each villus, is occupied, whilst the absorption of chyle is taking place, by a number of spherical vesicles or cells, varying in diameter from the 1-1000th to the 1-2000th of an inch, and containing an opalescent fluid. At the part where the vesicles approach the granular texture of the substance of the villus, minute granular or oily particles are seen. When the intestines contain no more chyme, the vesicles disappear almost entirely, the lacteals empty themselves, and the villi become flaccid; the epithelium, which had fallen off during the process of absorption, is then renewed. The vesicles at the extremities of the villi can scarcely be regarded in any other light than as *cells*, whose lives have but a very brief duration,—selecting from the materilas in contact with the surface of the villi, and appropriating these to their own growth,—then liberating them, by solution or disruption of the cell-wall, in a situation where they can be absorbed by the lacteals."[1]

The chyle thus introduced into the lacteals is found, on analysis, to consist of water, albumen, a mere trace of fibrin, animal extractive matters, fat, and salts. The

[1] Carpenter, loc. cit.

albumen is in a complete state of solution, and is entirely destitute of the power of coagulation. The salts also are completely dissolved; but the oily matter presents itself in the form of globules of various sizes, and of an immense number of exceedingly minute particles, first discovered by Mr. Gulliver, and called by him the *molecular base* of the chyle.

As it passes through the absorbents on the intestinal edge of the mesentery, towards the mesenteric glands, its characters undergo considerable change. The quantity of fibrin increases, so that the fluid shows a tendency to coagulate, when withdrawn from the vessels, and the oil and albumen are proportionably diminished in quantity; and, as it approaches the glands, we find it containing the peculiar chyle-corpuscles. These bodies have an average diameter of 1-4600th of an inch. They are usually minutely granulated on the surface; and seldom exhibit any nuclei, even when treated with acetic acid, though occasionally three or four central particles may be detected in them.

The same processes of change go on, with increased rapidity, as we approach the centre; and chyle drawn from the vessels intermediate between the mesenteric glands and the main duct, undergoes a regular coagulation, separating into clot and serum. The great majority of the chyle-corpuscles is included in the clot, and each of them may be seen under the microscope to be covered by a delicate film of oil. The fibrin differs from that of the blood in its inferior tendency to putrefaction.

Chyle taken from the thoracic duct coagulates almost instantaneously, and few or none of the corpuscles remain in the serum.

By what agency, then, is this alteration brought about? Albumen and fibrin being nearly identical in chemical composition, all that would appear necessary to effect the conversion of the one into the other is the communication of a higher degree of vitality; and this may readily enough be supposed to take place from the influence of the living solids, with which it is maintained in close and continual contact. Something more, however, is requisite to account for the almost entire disappearance of the oil, and its probable change into albumen. Now, to produce this, it is evident that nitrogen must be, in some way or other, communicated to the non-azotised substance, oil. This nitrogen can only be derived from the blood, partly, perhaps, from that contained in the vasa vasorum of the lymphatics, but chiefly from the blood-vessels of the glands. And this idea is supported by the fact, that the secretion of the liver, which is mainly formed from blood that has returned from these vessels, consists almost entirely of unazotised ingredients; and that, according to the remark of Mr. G. Ross, the constituents of *fatty matter*, added to those of *uric acid*, would very nearly give the atomic constituents of *albumen*.[1]

The chyle, however, is not all that the blood receives for its replenishment from the lymphatic vessels; there

[1] Carpenter, p. 492.

is also the continued in-pouring of colourless lymph, brought from every part of the system. This fluid differs from the one we have just been considering, chiefly by the much smaller amount of assimilable substances which it contains, the oil especially being in scarcely notable quantity. Like the chyle, as it advances onwards to its destination, it acquires the property of coagulation; its albumen being converted into fibrin, and a considerable number of corpuscles being visible in it, which appear to correspond in all respects with the colourless corpuscles of the blood. It seems to be little doubtful that the lymph is derived from the disintegration of the tissues of the body, the lymphatics taking up what is assimilable, while the veins absorb the effete particles.

With these additions, then, to its substantive ingredients, the chyle, the product of primary digestion, the lymph, the result of that secondary digestion which goes on continuously in every part of the living frame, and certain excrementitious remains of the latter process which have not been eliminated from the system,—the blood is poured into the right cavities of the heart, and from thence propelled into the lungs, there to undergo that all-important renovation, which will fit it for the maintenance of the functions.

I need not allude to the chemical changes in the constitution of the blood, which are effected by respiration, further than to recall to mind that there is an increase of oxygen and a decrease of carbon in arterial blood, as compared with venous; and that physiologists

are now pretty well agreed that the red corpuscles are the carriers of this oxygen to the tissues, while they bring back the carbonic acid to the lungs. With regard to the function of the colourless corpuscles there is more difference of opinion. To me it appears that the most intelligible and truth-seeming view is the one so ably advocated by Dr. Carpenter, viz. that their object is to elaborate fibrin.[1]

We have now followed the food, taken to supply materials for the repairs of waste, and the building up of new structures, from its first reception into the stomach, up to the point when, converted into blood, and oxygenated and fully animalised by contact with atmospheric air in the lungs, it is conveyed from the central organ of the circulation, into every part of the body. It remains that we examine the processes by which solid parts are nourished, and secretions and excretions formed.

There exudes from the capillary blood-vessels, in every portion of the living frame to which they find access, a fluid blastema, composed of the fibrin elaborated by the colourless corpuscles, and raised to the highest point of vitalization by the oxygen conveyed by the red corpuscles, and probably also containing a certain number of cell-germs, set free by the solution or rupture of the colourless corpuscles, and sufficiently minute to pass through the substance of the vascular parietes. From this blastema all the tissues are formed; and, as

[1] Principles of Physiology, p. 504 et seq.; or Report on Cells, in the Brit. and For. Med. Review, January 1843.

far as we yet know, in one or other of the following ways:

The living cells of the structure which the fluid permeates, select, by virtue of that peculiar vital power with which they are endued, such portions as are appropriate to minister to their own growth and reproduction; rejecting the remainder, which is then absorbed by the veins, and carried back into the torrent of the circulation. This appears to be the method by which the majority of the tissues are nourished; and a most marvellous process it is:—bone-cells, choosing that which will serve to build up their firm texture; muscular elements, selecting what will form irritable flesh; nerve-cells, appropriating only those matters which are necessary for the maintenance of their strangely-endowed structure. In what this electing faculty consists, we cannot say. It is one of the ultimate facts in physiology, with the bare knowledge of which we must remain contented; but of its permanent existence in the state of health there can be no doubt. May not many structural diseases originate in the perversion or destruction of this faculty?

It does not, however, appear that the presence of ready-formed cells is essential in all cases, the existence of formative germs in the blood-plasma affording, in certain positions, all the required elements. We have examples of this mode of growth in the epidermis of the skin, and the epithelium of mucous membrane; for what has been termed the *rete mucosum*, and supposed to be a separate structure of itself, is in reality

nothing but the last-formed portion of the cuticle, which, on examination, is found to consist of granular nuclei, in progress of development into cells. And that these nuclei are not themselves the product of the living cells of the true skin, is evident from the interposition of the structureless basement membrane.

It is also doubtful whether the agency of cells is needful for the formation of the fibrous tissues; whether they may not result from the spontaneous organization of the plastic blastema, remaining in contact with a living solid, and thus retaining its vitality unimpaired. Indeed, Dr. Addison has shown that when the formative energies are exalted by the excitement of inflammation, this may be effected even on dead surfaces. He says—"Provide six or eight slips of glass, such as are usually employed for mounting microscopical objects, and as many smaller pieces. Having drawn blood from a person with rheumatic fever, or any other inflammatory disease, place a drop of the colourless liquor sanguinis before it fibrillates, on each of the large slips of glass; cover one *immediately* with one of the smaller slips, and the others, one after another, *at intervals of thirty or forty seconds;* then, on examining them by the microscope, *the first* will exhibit colourless blood-corpuscles in various conditions, and numerous minute molecules distributed through a more or less copious fibrous network; and *the last* will be a tough, coherent, and very elastic membrane, which cannot be broken to pieces, nor resolved into smaller fragments, however roughly or strongly the two pieces of glass be

made to rub against each other. This is a "glaring instance" of a compact, tough, elastic, colourless, and fibrous tissue, forming from the colourless elements of the blood, and the several stages of its formation may be actually seen and determined. Numerous corpuscles may be observed in all these preparations to have resolved themselves, or to have fallen down into a number of minute molecules, which are spread out over a somewhat larger area than that occupied by the entire corpuscles; and although still retaining a more or less perfectly circular outline, yet refracting the light in a manner very different from that in which the corpuscles themselves are seen to do. It is from these and various other larger and more irregular masses of molecules or disintegrated corpuscles that the fibrinous elements shoot out on all sides as from so many centres; or frequently the filaments are more copious in two opposite directions."[1]

This quotation leads me to say a few words on one or two points connected with the subject of inflammation. It seems now pretty well established, by the various examinations which have been made of the state of the vessels in the inflamed web of the frog, that the essential conditions are, dilated capillaries with obstruction of their contents, and increased flow through the supplying arteries. The obstruction is caused, partly by diminished tone in the capillary parietes, but also, and chiefly by the adhesion of a

[1] Trans. Prov. Med. and Surg. Association, vol. xii, pp. 244-5.

number of the colourless corpuscles of the blood to the walls of the vessels, which thus contract the diameter of the channels through which the red corpuscles pass, and eventually arrest these too, so that the whole becomes plugged up. Dr. Williams has given a very satisfactory explanation of the rapid generation of these corpuscles, which is not merely an appearance, but a reality, for they are found in greater numbers than usual in blood drawn *from any part* of the body, while inflammation is going on, which would not be the case if there were merely an undue gathering in the part specially affected. On the contrary, there would be fewer in the general mass, by reason of their local arrestment. "The blood liquid," he says, "is highly charged with protein, which needs only a further process of oxidation to assume the solid form of the deutoxide: this process is supplied by the free current of arterial blood (determination) which rushes into the obstructed portions, and brings the red particles, the oxygen carriers, in such forcible contact with the blood liquor, as favours the transfer of oxygen to the protein contained in it. As the protein becomes oxidised, it consolidates in a granular form, and the more readily around the oily molecules always diffused through the blood liquid; and these form the nucleoli visible in the larger granules. But the granules also cohere in clusters, and form the pale corpuscles of various sizes which appear adhering to, and creeping along the sides of irritated vessels. This explanation corresponds with the sudden manner in which they appear in such

numbers in the vessels of the frog's web; not only after continued irritation, but after momentary rough handling or squeezing the web, which partially obstructs the vessels, and directs the force of the arterial current on their contents; the walls then appear studded with adherent and creeping corpuscles; but, as the impediment and the determination are not here permanent, these corpuscles are soon swept away and disappear. In inflamed vessels, on the other hand, they are a constant element."[1]

These corpuscles, thus newly formed, and thus arrested in their progress onwards, do not remain where they are placed inoperative. They are living, active cells, which have a special function to perform: and that function is to produce the structural changes, permanent or otherwise, which result from the inflam-

[1] Principles of Medicine, pp. 261-3. These views regarding inflammation have been opposed by one of our most eminent histologists, my friend Professor Bennett, of Edinburgh; but my own observations entirely coincide with those of Dr. Williams. In the web of a frog, in which I could see only here and there a few straggling colourless corpuscles, during prolonged watching, while the parts were untouched, *I saw them in numbers* rolling slowly along, often with a drag-tail, or adhering to the sides, and partially blocking up the calibre of the vessel, after an irritant (tincture of ginger) had been applied. I could not possibly be mistaken in these facts. The *motion* showed they were corpuscles, not nuclei of epithelium scales, as Dr. Bennett has supposed. I have seen them carried forward and backward with the oscillating current of oval corpuscles; I have seen one passing slowly from the orifice of a communicating channel, adhering by one side, and agitated in a waving manner by the strong cross-current it met, till it became separated, entered the larger channel, and settled on its lower wall. This could be no fallacy. It was as distinct as any microscopic object or motions could be. These observations were not made only on one animal; I have witnessed the phenomena both in the young and the old frog, and that in every trial made.

matory process. Dr. Addison believes that the corpuscles themselves, after first forming integral parts of the capillary walls, pass bodily through, and constitute the effused matter,—plastic lymph, or pus, or whatever it may be. But this appears somewhat doubtful, especially when we take into consideration the rapidity with which these effusions sometimes take place. I do not, of course, speak of the serous exudation, which appears to be a mere physical result of the increased pressure and obstruction in the vessels, a draining out of the watery parts of the blood;—but of the more organized matters which can only be formed by the operation of vital forces. It would seem more probable that the corpuscles, thus brought into contact with, and adhering to the walls of the capillary vessels, either dissolve, or give way so that their contents are poured out, and permeate the tissues of the part. And when this has taken place, there are further changes in the effused fluid; it coagulates, fibrillates, and among the delicate fibres, a number of granulated bodies make their appearance. These are the exudation-corpuscles; they bear considerable resemblance to the colourless blood-particles, but differ in this respect, that acetic acid brings out no appearance of nuclei. In fact, they are themselves the enlarged and growing nuclei of previously existing cells. As the process of organization goes on, these bodies gradually disappear, having performed their work, and the fibrous tissue remains alone. Or, under other circumstances, to be afterwards noticed, they degenerate into pus-corpuscles.

Now, it is quite evident that this process is perfectly analogous to the second form of nutrition above described, and we are altogether warranted in describing inflammation as nothing more than an abnormal modification of ordinary nutritive actions. It is abnormal in the undue rapidity with which it is effected, and in its overstepping and in some cases setting aside the natural processes by which healthy tissues are built up, or healthy secretions formed; substituting a hastily worked new substance for the slower and more complete elaboration of perfect structures. Still, the method by which it is carried on is analogous, though exaggerated, and the forces called into play are, in a great measure, identical.

For, how, to complete the picture, are secretions and excretions produced? We have the same exudation of blood liquor; but instead of this undergoing organization, as in the instances before noticed, the ultimate secernent cells of the organ, which it permeates, select from it such of the constituents as are appropriate for the purpose they are destined to fulfil, and after elaborating them still further in their own interior, either deposit them in parts where they remain stored up, as is the case with the fatty matter of the adipose tissue, the humours of the eye, and some others; or discharge them on the nearest free surface, where, according to their nature, they form mucus, or bile, or pancreatic fluid, or urine, &c. The process, in truth, is just another example of cell-growth, the chief difference between it and that of the nutrition of solid structures,

being that the results are not intended to be so permanent; and that, for the most part, they are elaborated from those portions of the blood-liquor which are derived from the waste of tissues, and unfitted to form any longer a part of the living whole. And in this consists the true distinction between secretions and excretions: the former have yet some purpose to serve in the animal economy; the latter are altogether useless, and, if retained, are not unfrequently productive of fatal injury.

There is, then, great simplicity of *method* observable in the way in which the growth of the body, in all its various parts, is effected, and in the means adopted for securing the freshness and activity of all its several components; but the *machinery* is in the highest degree complicated, and the integrity of its working depends upon a vast number of concurrent influences. An error in any one point must, of necessity, be propagated to all the rest; for all hang together by the closest bonds, and are connected by the most delicate sympathies.

Arrest, for a time, or diminish, or pervert, the selecting power of those microscopic cells, which separate the ingredients of the chyle from the heterogeneous mass passing along the intestinal tube, and what is the consequence?—We have an insufficient, or a vitiated pabulum for the blood, and therefore *it* cannot supply the organs with right nourishment. Reduce the amount of excretions, and the retained effete particles will poison, more or less, the whole circulating fluids. Interfere with the respiratory functions, and the imperfectly-

aerated blood will fail to do its proper work in every part; all the vital processes will be carried on inefficiently: for it is abundantly evident, that a due supply of free or loosely-combined oxygen is essential for the right performance of those chemico-vital operations which are included under the general term nutrition. It is most important to bear this fact in mind.

We have now to consider what is the state of these matters in phthisis, or rather, in that diathesis in which tubercular diseases are liable to occur; for when once morbid processes have been definitively set up, the derangement of functions, consequent upon these processes, greatly complicates the question, and diminishes the value of the deductions, by reason of the disturbing influences thus introduced. And, seeing that we have no means of obtaining ocular demonstration of the nutritive workings themselves, in the living body of man, we must be contented to judge of their healthy or diseased condition by the effects only which they produce. Here our evidence is quite conclusive.

I quote the description given by Mr. Phillips, who has written one of the latest and most valuable works we possess on the subject of Scrofula, and who is sufficiently sceptical regarding the value of the supposed signs of the diathesis, to ensure the probability that his own observations have not been recorded lightly.

"In the form of the body there is usually observable a want of muscular development, but even this is often absent. There is often an appearance of plumpness or roundness, which is the result not of muscular develop-

ment, but simply of an hypertrophied, or infiltrated condition of the cellular tissue, and which rapidly disappears under fatiguing exercise, privation, or disease. Commonly there is a general paleness and coldness of the surface of the body, which is owing to a feeble circulating apparatus; but in a large number of cases, about one fifth of the whole, that paleness does not extend to the face. The colour of the hair is very variable, but for the most part it inclines to a dark tint. Of nearly 9,000 scrofulous children, I have myself examined, a little over 32 per cent. had light hair and eyes. The alæ nasi may be broad, but for the most part they are not so; the upper lip, or even both, may be tumid, but in a majority of cases they are not so. There is not, as some persons have supposed, anything constant in the shape of the lower jaw, or in the appearance of the teeth. The abdomen is commonly tumid. The whole of the mucous surfaces are especially liable to derangement; discharges from the nose, the eye, and the ear, are common. The digestive mucous membrane affords early indications of suffering; the tongue has commonly a dirty whitish coating, the tonsils are usually enlarged, and they are often so tumid as to impress a disagreeable and frequently husky character upon the voice, and to cause snoring when the patient is asleep. A still more deleterious influence is exercised by these tumid bodies; they lessen so much the channel for the psssage of air in respiration, that the sufficient development of the chest may be interfered with. The stomach and bowels are frequently disordered, and digestion is

ill performed; acrid eructations are common, flatulence is often very troublesome, and the action of the bowels is very irregular, sometimes relaxed, at others constipated; sometimes the evacuations are clay coloured, very offensive, and of varying consistency; at others, having a redundancy of bile. Similar evidences of derangement are observed in the air-passages, commencing at the nose (which exhibits increased secretions upon the occurrence of very slight variations in temperature), and passing through their whole length. Similar phenomena are observed in the mucous tissue of the genito-urinary system; the bladder often shows an impatience of the presence of the urine, and the desire to void it is often frequent. The skin, though often dry and hard, is sometimes the seat of a considerable greasy exhalation; sometimes it is found to be fetid and sour. The acidity of the exhalation may be so decided as to determine a reaction upon litmus paper; in many of the cases observed by Mr. Kaye on the Mediterranean coast it was so. The scalp and other parts of the cutaneous integuments are often the seat of eruptive affections. The absence of vascular and muscular energy often causes the child to lie and sit about much, and indisposes him to enter into the energetic games of his playfellows. As to the intellectual development claimed for scrofulous persons, I am bound to say that it is usually wanting. That many scrofulous children present that character is quite true; but the result of very careful observation has convinced me, that the overwhelming majority are without those superior intellectual

qualities which have been pointed out as their ordinary character. Among the better classes, the feebleness of a scrofulous child attaches to him an interest which, without it, he might not have enjoyed. To compensate for his physical inferiority, the anxious parent seeks to make him mentally superior to his bodily stronger fellows, and frequently succeeds; but often the limit of healthy action is passed, the nervous and intellectual systems have the vital action concentrated on them too intensely; the sufferer loses flesh, the general health languishes, and the intellectual faculties may give way, destroyed by an opposite, but not less sure method than that which breaks down the poor man's child.

"Where we find persons tainted with scrofula living under less favoured circumstances, the picture to be drawn of their physical and intellectual characters is widely different. In the cottages of the poor we find the child with the scrofulous diathesis often pallid, puffy, insensible, listless and filthy—the skin dry, harsh, and too commonly covered with eruptions—the mucous surfaces deranged, the attention not easily fixed nor even excited—the senses obtuse, the mind greatly wanting in intelligence, unimpressionable and almost incapable of action."[1]

It is impossible to contemplate this picture, without seeing that it indicates a fundamental error in that great process which we have been engaged in examining. All parts of the body bear evidence to their

[1] Phillips's Scrofula and its Treatment, p. 30 et seq.

imperfect or irregular nutrition. All, at times, declare that the materials brought for their support are insufficient, or unsuited, or that they themselves have not the power to make right use of them. Do our previous investigations throw any light on the *cause* of this?

Referring back to the last section, we perceive that analyses of the blood of tuberculous subjects give, as their most uniform result, a notable diminution in the amount of red corpuscles. We know that the function of these corpuscles is to carry oxygen to the different tissues, and that without the agency of this essential ingredient the processes of healthy nutrition cannot go on unimpaired. And, it is manifest, that reduction of the means of transport must, proportionably, diminish the total quantity of material transported, unless the frequency of the passings to and fro be increased, which is assuredly not usually the case in scrofulous subjects, whose circulation is for the most part languid. We have, therefore, in this fact, an explanation of the coldness and pallor of the surface of the body; the animal heat is lowered, because the transformations by which it is kept up, are carried on less actively and less efficiently. We see why muscular energy is defective, the natural stimulus not being duly supplied. We can understand why the brain should be so often sluggish; for we know that these manifestations of impeded function are exhibited, in an exaggerated form, in cases of partial asphyxia, from insufficient aeration of the blood.

But this is not all that follows from the reduced number of oxygen carriers. The blood-liquor does not

undergo the full extent of vitalization; and, therefore, though the fibrin it contains is increased in absolute quantity, it is of less value, from its low plasticity: the defect of oxygen necessarily reduces it, more or less, from the condition of arterial towards that of venous fibrin. Hence, the structures formed are imperfect; and hence, when this state of things has gone on for a considerable time, and the consequent derangements have become more serious and more persistent, we have the deposit of the caco-plastic or aplastic tubercle in the place of healthy tissue. It is no little confirmation of the accuracy of these views, that the chemical characteristics of tubercle are precisely in accordance with them. Their protein basis is albuminous,—in part, according to many chemists, caseous,—and they are signalised by the increased proportions of fatty and extractive matters.

All these alike testify to the diminished activity of the vital operations, which operations, as we have seen, cannot be duly effected without a full supply of oxygen. The fibrin of a coagulum in which decomposition has commenced, presents a granular mode of aggregation in its particles, thus showing its affinity to albumen, when its peculiar vital characters have departed, or are possessed by it in an inferior degree.[1]

It may, perhaps, be objected, that the presence of pyin, or the tritoxide of protein, in tubercle, is opposed to the above theory; but, I think, the fact is sus-

[1] Carpenter, loc. cit., p. 480.

ceptible of explanation. We have seen that in the process of inflammation, the determination of arterial blood to the part affected, and the force with which it is impelled, result in the communication of an extra proportion of oxygen to the plasma, and the formation of the solid deutoxide of protein, which is especially capable of organization. But the continued operation, or the excess of the same causes, may and often do produce a different result. There is too much oxygen afforded and given up, the solid deutoxide becomes converted into the soluble tritoxide of protein, and we have pus instead of tissue. This is the rationale of suppuration as a consequence of the severity of the inflammatory process. But we may have the same effusion where there is no exalted activity; this is chiefly observed where air has access to the inflamed surface, and there can be little doubt that it is occasioned by the absorption of oxygen thus extraneously supplied. The presence therefore of pyin in a tubercle, is not necessarily inconsistent with what has been above stated of the tubercle itself resulting, in part at least, from the diminished quantity of the oxygen-carriers in the blood; it may indicate the existence of inflammatory action in the living solids around, or it may be the result merely of the atmospheric oxygen, tending to disintegrate the parts, whose vital attractions are already at a low ebb.

On the same principle, the difference between the contents of a healthy and of a scrofulous abscess is perfectly intelligible. In the first case, the richly-laden blood carries with it sufficient oxygen to convert the

whole of the exudation into purulent matter; in the second, the impoverished blood has sufficient addition to its ordinary stock to oxidize some of the exudation-corpuscles, but it has not enough for all, nor is it even able to raise the remainder to the condition of the organizable deutoxide, and we have, therefore, flakes of coagulated aplastic albumen scattered through the effused fluid.

I believe, then, that this defect of the corpuscular element of the blood plays a very essential part in the production of tubercle; and the fact that chlorosis (in which disease the pathological state we are considering is remarkably prominent), when it proves fatal, does so generally by the development of pulmonary consumption, is strikingly confirmative of such an opinion. But I do not believe that this is all that is requisite;—that the abstraction, or rather the non-generation of a certain amount of red particles, must of necessity and invariably be followed by the deposition of tubercular matter. The disease to which I have just alluded at once gives the negative to such an idea, for it may, and often does exist in great severity, inducing extreme emaciation and a host of other evils, without the smallest appearance of tubercle.

Nor do I think that we have arrived at the fountain of the evil, when we have ascertained the existence of an abnormal condition of the blood in tubercular cases; at least I am convinced that those changes which are appreciable by our senses, are, either singly or combined, insufficient to account satisfactorily for the phenomena. There must be more than this: they explain a part, but

not the whole; they show why the nutritive processes are defective, but not why they are defective in this particular way. And they must themselves depend upon some prior cause, for blood does not become diseased spontaneously.

But passing by this for the present, we have, I think, adduced sufficient evidence to demonstrate that the particular substance tubercle, is the result of abnormal nutrition; that it is the necessary consequence of a *peculiar* modification of those processes by which the living body is maintained in integrity, and by which its several parts grow and increase. I say *peculiar*, because it is clear that *all* mal-nutrition does not give rise to the production of tubercle; otherwise, every one affected with severe or prolonged dyspepsia would inevitably become tuberculous, which we know is not the case. It is a special disease, and owns a special parentage.

There is just one other point to which I must allude before closing this branch of the subject. Mr. Paget, in his interesting and profoundly philosophical Lectures on Nutrition, has endeavoured to show, and I think successfully, that each organic part of the healthy body serves, when first deposited, as an *excretion;* that the removal of its elements from the general circulating mass, fits the remainder for the construction of other tissues. Now, it appears to me that we have in this an explanation of what is otherwise somewhat difficult to understand, viz. the very early occurrence of emaciation in many cases of phthisis pulmonalis. It is not

due to the presence of fever, for at this period hectic has not set in. It is not caused by excessive evacuations, either from the mucous membranes or the skin, for as yet the functions of these two tegumentary organs are discharged in an ordinary way. Nor is it dependent upon any manifest dyspeptic derangement, for at this stage of the disease the signs of such are often wanting. To say that it is a consequence of the tubercular diathesis, is to affirm what is true of itself, but not explanatory; for the diathesis existed from birth, and the emaciation only appeared when the abnormal deposit took place. But, if Mr. Paget be correct, we can see at once that the separation of the *imperfect* substance, tubercle, from the blood, instead of the *perfect* tissue whose place it occupies, must of necessity render the remainder of that fluid in measure unfitted for its office as the great minister of nutrition; it retains what it should have lost, or it has parted with more than it should have given up. It is not healthy, and it cannot, therefore, act with healthy energy. And exactly in proportion as this irregular process goes on, does the vitiation of the blood increase also, until almost all parts of the body, ill-nourished and ill-constructed, fall into a condition of more or less complete marasmus.

These remarks apply especially to that species of phthisis which creeps on insidiously, not as the sequel of any preexisting disease. When the lung affection is the result of inflammation, as pneumonia, or of that modification of the inflammatory process which goes by

the name of catarrh; or when its first symptoms are manifested on the subsidence of any general malady, as the exanthemata; then the accompanying emaciation may be dependent upon other additional causes also; though still, I believe, what has been stated above is an important and an essential part of the observed process.

SECTION VI.

IDENTITY OF TUBERCULAR AND SCROFULOUS DISEASES.

It will have been observed, that in the preceding pages I have used the words scrofulous and tubercular as interchangeable terms, as exponents of the same general fact or facts. This has been done from the belief that there is a perfect identity of nature in the affections to which these designations are applied; that they own the same cause, and consist of the same elements, being merely distinguished by differences of locality. This is, in truth, the most commonly received opinion, but names of note have not been wanting to support the opposite view of the question, and though the arguments adduced appear to me inconclusive, they are not such as to be undeserving of attention. In considering the subject, I shall take up the line of argument adopted by Mr. Phillips, in the work already quoted, both because it is the most recent, and because the observations on which it is based are most extensive, and most carefully selected.

Mr. Phillips acknowledges that there are no appreciable differences between scrofulous and tubercular matter, so far as their physical and chemical characters are concerned; but he lays little stress upon this confessed fact. To me, on the other hand, it appears

all-important; constituting a difficulty from which it is no easy matter to make a scientific escape. We have a peculiar condition of body giving rise to a peculiar product in the lungs; we have, by Mr. Phillips's confession, a similar general condition, giving origin to a deposit in the subcutaneous glands, which to all our senses aided by the best appliances, appears precisely the same as the former. The two constitutions are closely analogous; the two products are so alike as to be indistinguishable one from the other; have we not in this good *a priori* grounds for the opinion, that both evidence the existence of the same disease. The tubercle, be it observed, is not the disease, any more than the scrofulous matter; they are effects—consequents; and a sound philosophy appears to me to demand, that when we find two effects, two consequents, so precisely alike, that we can by no means detect discrepancies, we should attribute them to the same causes, the same antecedents. At the very least, the grounds on which we come to the opposite conclusion should be most strong, to warrant such departure from ordinary principles of reasoning. We shall see immediately whether those on which Mr. Phillips rests, have this stable character.

The first argument brought forward is the difference in the condition of the parts, prior to the deposition of the morbid product. In the subcutaneous glands inflammation always precedes the appearance of the scrofulous matter, while in the lungs tubercle is most generally formed without any such preliminary proceeding. Mr.

Phillips acknowledges that pneumonia may give origin to phthisis, but contends, and rightly, that this is not the only cause, nor the usual one; and that "in the absence of other causes, inflammatory action does not seem capable of generating tubercular matter."[1] In reference to this last assertion, I would merely remark that it applies to scrofulous no less than to tubercular deposits; in neither case can simple inflammation produce the observed results; there must be a fore-existing predisposition. But, granting that the other facts are as is stated, and I am by no means inclined to maintain the negative, what do they prove? That one particular organ will take on a special diseased action, only when its functional energies are exalted or perverted by the inflammatory process, while another, always more active in its vital workings, does not require this additional stimulus. Thus much they teach, and nothing more. They show a difference in the *susceptibility* of the two organs, but demonstrate nothing as to any difference in the nature of the morbid actions. They prove that in the highly-vascular and delicately-constructed lung, simple perversion of the ordinary processes of nutrition may give rise to the deposit of aplastic tubercle, while in the less vascular and less complicated gland there must be the exalted as well as perverted nutrition to which we give the name of inflammation. Much of the obscurity with which subjects of this kind have been overlaid, would have been avoided had pathologists generally adopted more correct views

[1] Loc. cit., p. 68.

of the true nature of the inflammatory process; had it not been regarded as something quite special in itself, quite different from all other vital activities.

Some authorities have laid much stress on fancied differences in the vascularity of the two products; Mr. Phillips, however, does not insist upon them, and it is quite clear that the point is not of the smallest importance, for a correct acquaintance with the essential constituents of both will show us that they are alike *extra-vascular*. We come, therefore, to a consideration of the circumstances under which the morbid substances in question are deposited.

Here the arguments rest entirely on the basis of certain statistical inquiries, and, before noticing them in detail, I would make one or two preliminary observations. No one can deny the value of the numerical method for certain purposes, nor be blind to the advantages which it has conferred upon the science of medicine. But, like all other things, it is good only in its own peculiar sphere. It can tell us the relative frequency of different diseases; the circumstances under which they most commonly arise, and by which they are variously modified; it can make us acquainted with the prevalence of complications, show which are the most common, and for which we should be on the look out when certain definite conditions are present; and it may aid us in our choice of means of treatment, by tabulating the results of different plans. But for showing the *essential nature* of a disease it is far less valuable, and far less trustworthy. An enlightened

pathology, not the arithmetic of statistics, must be our guide.

But, setting aside these considerations, there is, I conceive, a fundamental fallacy in the particular calculations to which I am specially referring, which vitiates all the conclusions drawn from them; and that fallacy consists in the limitation of the term scrofula to that form of disease in which the subcutaneous glands are affected. In many parts of his work Mr. Phillips is compelled to use the term in a more extended sense, but the entire argument on the point now before us depends upon its employment with this very restricted meaning. Now, it is quite clear that this is not the generally received acceptation; that by "scrofula" a class of diseases, rather than one special manifestation is ordinarily understood; and therefore the number of deaths noted in the tables of the Registrar-general may be fairly taken to represent the mortality occurring under the larger not the limited application, and if so, the returns are useless for the purpose which they have been made to serve. Indeed, I very much doubt whether any example of death from scrofula, of which the diseased cervical glands was the only sign, has ever been observed; and if other affections are included, then the definition fails, and the whole argument is fatally damaged, for in the returns, the state of these glands is passed by without special notice.

But to proceed. It appears that the mortality is greatest from scrofula before puberty, and from phthisis after; that scrofula finds most of its victims among males,

and phthisis among females. Do these facts prove an essential difference between the two diseases? Are they not susceptible of a most easy explanation on the supposition of the identity of the maladies? We know well that the localization of cancer is greatly influenced by age; we know that some parts of the body are more frequently affected in the male, and others in the female, —that the lips, the stomach, the liver, are destroyed by its ravages most commonly in the former, while as regards the genital organs, the returns show an enormously preponderating majority against the latter. But no one has ever attempted to argue, that therefore, the diseases though similar, are not the same. And yet, I verily believe, as good a case might be made out for the one as for the other of these propositions.

The varied external circumstances in which individuals are placed at different periods of their lives; the peculiar morbific influences to which they are exposed; and the special modifications of functional activity and organic development which belong to the two sexes, are, I apprehend, quite sufficient to account for the observed discrepancies. And the same explanation applies, and with equal force, to the relative geographic distribution of scrofula and phthisis;—the one or the other form of the disease is most prevalent in certain countries, or in certain districts of the same country, as a consequence of peculiar exciting or predisposing circumstances.

Take, by way of example, two children of the same family, both inheriting from their parents a radically defective constitution. The one, a boy, is sent to

school, and engages with his companions in all manner of athletic exercises. He receives an injury upon his knee; inflammation follows; the latent disease, thus roused into activity, becomes fully developed, and he sinks, exhausted by the discharges and the constitutional irritation from his scrofulous joint. The other is a girl, and not exposed to the same sources of danger; but she is confined much to the house in the acquisition of certain so-called necessary accomplishments, and exposed to the frequent sudden alternations of temperature which are unavoidable in following out the amusements of fashionable life; and thus her lungs, ill-defended because sufficient warm clothing is not worn, become at last affected, and she dies of phthisis. Is not the disease identical in both, though its manifestations are different?

I had lately under my care a lady, who lost an elder sister in pulmonary consumption. She suffered from glandular abscesses in the neck in childhood, had suspicious symptoms in the chest, was the subject of hip-disease, and manifested many other evidences of the strumous diathesis. A brother, exposed to peculiar influences in a warm climate, was affected for a considerable time with non-syphilitic ulceration of the back of the throat, and caries of the turbinated bones of the nose. Is it possible to deny the identity here?

Another argument, pointing in the same direction, may be drawn from the nature of the acknowledged causes. In both, hereditary transmission is the principal channel of disease; the children suffer, because

the parents were not healthy.[1] But both may be called into being by the same external agencies; as deficient food and clothing, damp, unwholesome and ill-ventilated dwellings, without previously existing contamination, at least as far as we are able to discover.

It appears to me, therefore, most consistent with a sound and rational pathology, most in accordance with the general rules that guide us in our reasonings upon morbid actions, and most conducive to clear views and precision of practice, to regard scrofulous affections of external parts, and tuberculous disease of the lungs, as separate manifestations of the one same constitutional taint, originating in the same defect of organic elements and vital energies, and to be guarded against, or treated, when existing, by the same means.

[1] The statement in the text is expressive of the general opinion, but it probably requires some modification. The researches of Louis threw doubts upon the frequency of hereditary transmission as a cause of phthisis; and while these pages have been passing through the press, I have received Dr. Walshe's valuable Report (Brit. and For. Med.-Chir. Rev. for January 1849), from which it appears, as the result of analysis of 446 cases, that "phthisis in the adult hospital-population of this country is, to a slight amount only, a disease demonstrably derived from parents." In what way more extended observations, among all classes and all ages, will tell upon the question, remains yet to be seen.

PART II.

OF THE MANIFESTED DISEASE.

SECTION I.

FORMS AND VARIETIES OF PHTHISIS.

True pulmonary consumption is developed *only* in those subjects, whose constitutional powers are either originally defective, or in whom the vital energies have been unduly exhausted by the long-continued influence of depressing agencies. But, in this essential and never absent debility, there are many shades and gradations. One man will succumb at once, at the first onset of disease, overwhelmed, as it were, and utterly unable to resist. Another battles long and hard, disputes every inch of ground, and only yields the citadel at length to his resistless adversary, when the outposts have been long in his hands, and the wasting warfare has exhausted all supplies. And the results of necroscopic examinations are altogether in accordance with these observed facts.

A patient dies of phthisis, after an illness extending over many months. On inspection of the body, we find extensive pleural adhesions. The upper lobe is hard, and transformed into a semi-transparent gray matter, with here and there some softened tubercles, in course of evacuation. The apex contains one or more cavities of considerable size. While the lower lobe is still permeable to air through a considerable part of its

extent, and exhibits scattered tubercles and numerous gray granulations.[1]

We have here a preponderance of gray semitransparent tubercles,—*sthenic* tubercles, as they are called by Dr. Addison, of Guy's Hospital,—and their existence is an index of comparative activity of the vital forces. They are *caco-plastic* rather than *aplastic;* and though incapable of undergoing a higher organization, and having, in common with all tubercles, an inherent tendency to decay, as is manifest from the fact that they do at length break down and produce cavities in the pulmonary texture, they are yet sufficiently near in character to the perfect tissue, not to give rise to any marked or excessive irritation ; and they retain sufficient vitality to resist the degenerating process for a considerable time. It is in cases of this kind, that we sometimes observe a more or less decided collapse of the infra-clavicular regions of the chest, before there has been any softening and evacuation of tubercular matter; and it is caused by the faculty of contraction which belongs to tubercles of this kind, in like manner as to other formations of a low degree of vitality. It is a good sign, indicating a constitution not irreparabl defective, and showing that, in all probability, there will be time for the operation of our remedies, and something like a response in the system to the demands we make upon it. I have met with many instances ; and in every one, so far as I can recollect, the progress of

[1] This is not an imaginary sketch ; it is drawn from a case narrated by Louis, p. 18, Syd. Soc. edit.

the disease has been slow, while in some it has been manifestly arrested, if not permanently, at least for a period of considerable extent. Of course, in considering the value of the sign, it is essential to distinguish between the falling in of the parietes of the chest thus caused, and that more extensive collapse which depends upon approximation of the sides of an excavation. The two are altogether different in their indications, and to mistake the one for the other would do anything but exalt the observer's character for diagnostic accuracy.

It were well if this were the only form under which we meet with phthisis; but, unfortunately, experience testifies that it too often runs a very different course. Omitting, for the present, any notice of acute cases, properly so called, in which another and most powerful element of disease is brought into play, I quote another case from Louis, which proved fatal in six months.[1] The patient was a girl, æt. 20. On examination after death, there were found firm, tolerably thick, and nearly general adhesions between the right lung and costal pleura, at its apex and posteriorly. Removal of these adhesions from the external surface of the organ displayed a broad deep hollow, resulting from the presence of an enormous cavity, occupying three fourths or four fifths of the entire mass of the lung, extending from the apex to within nearly an inch of the base, and from the posterior border to within about five lines of the anterior. The rest of the organ contained gray granulations and tubercles in abundance, in such

[1] Loc. cit., p. 10.

manner as to leave scarcely a tenth part of the entire permeable to the air. There was a small cavity in the apex of the left lung, and abundant tubercles, and gray granulations throughout the whole of the upper lobe.

The picture here presented to us is in striking contrast with the one we have just contemplated. In a space of time comparatively short, one lung had almost entirely disappeared. There were no firm indurations, no tendency to contraction; the matter effused was altogether aplastic, and the consequent destruction of parts fearfully extensive. I doubt if cases of this kind ever occur, excepting in subjects who have a strong hereditary predisposition, and they are undoubtedly the most hopeless that a physician can encounter. The proclivity to disintegration is so decided, that our remedies are sadly at fault; the vital powers are so low, that our means are inadequate to excite them to healthy activity. We have, in fact, little or nothing to work upon, for in instances of this kind even the first primary steps of digestion are defective; in Louis' case the stomach was perforated, and the greater part of its lining membrane as soft as mucus, and as thin as blotting-paper; and it is quite clear, that if the original changes in the food are not properly effected, there is small chance of that fundamental error being rectified afterwards, more especially when there is an inherent degeneracy of the organic elements.

It is not difficult to understand the rationale of these differences. They depend, not on accidental or ex-

ternal circumstances, nor, properly speaking, on relative severity of attack, but simply on the more or less profound contamination of the blood. The contamination, indeed, exists in all cases; if it were absent there would be no consumption; but the disease is tractable or intractable; slow or rapid in its progress, just in proportion as this poisoning has been more or less extensive and decided.

There is, however, one, and a very important, exception to this rule; or rather, there is a condition which may, and often does, produce the most formidable destruction of parts with great rapidity, even when the constitutional taint is not pre-eminently marked. That condition is inflammation, and the cases in which it occurs, as the primary disease, constitute what is most correctly denominated acute phthisis.

In cases of this description we have, from the commencement, symptoms of grave import. The febrile movement is decided, persistent, and often severe. The cough is frequent, the respiration difficult, and the general distress great. It is impossible to overlook the existence of urgent disease; but it is quite possible, and very common, to mistake its nature, and to blunder in the treatment. Nor is there much time to repair errors; for, if unchecked at first, the malady runs through a rapid course, and the patient dies. After death, the lungs are found in one of two conditions. They may be crammed full of miliary tubercles, the surrounding tissue being infiltrated with serosity, or partially emphysematous, or it may be quite unaffected,

and the bronchial tubes inflamed. Or the pulmonary tissue may be completely infiltrated with tuberculous matter, large masses being converted into a cheesy substance.

It is quite clear that these changes are dependent upon inflammation; there are all the general symptoms of that form of disease, and the alterations of structure produced only differ from those which result from ordinary inflammation, in the same way as the contents of a scrofulous abscess differ from those of a healthy one, if such a term may be used.

When pneumonia occurs in a subject with a constitution previously sound, the blood-liquor, which exudes from the congested capillaries in the first stage, is rich in plastic fibrin; the exudation-corpuscles are normally developed; the process of organization goes on, and the true hepatization ensues. But when a similar attack takes place in an individual with a constitutional tuberculous taint, the same steps are gone through, with a very different, though perfectly intelligible result. The blood, as we have seen, is deficient in red corpuscles; it does not contain enough oxygen to vitalize the fibrin thoroughly; and, still more than that, it is, in all its elements, infected and degraded by the peculiar poison which is the origin of all tuberculous disease, and is therefore incapable of performing its proper work. The plasma coagulates, but it is in the form of albumen, rather than of fibrin. Active exudation-corpuscles are replaced by the granules and corpuscles of tubercle; and we have the unorganizable and unabsorbable cheesy infiltration.

It appears to me very probable, that the other form of acute phthisis, that in which the lungs are invaded by a vast number of miliary granulations, is dependent rather upon bronchitis than pneumonia; and that the rationale of its production is something like the following. In the ordinary disease, the inflammation of the mucous membrane of the air-tubes gives rise to a rapid generation of secernent cells, and an equally rapid effusion of their contents, which, by the operation of the same cause, are altered in their qualities, being more than usually viscid, and containing free albumen. Now, we have already seen that secretion is nothing more nor less than a particular modification of cell-growth, precisely analogous in its nature to the nutrition of the solid tissues, and differing chiefly in the less permanent character of its resultants. In bronchitis there is no new structure formed, but there is an excess of changed secretion; and in like manner as we have found that the solid effusion of tuberculous pneumonia differs from that of the common disease, so I believe that tubercle takes the place of the normal secretion in the case before us. Nor will this appear at all inexplicable, when we reflect upon the remarkable analogies which Dr. Addison has shown to exist between the liquor sanguinis at the surface of buffy blood and mucus: "The former," he says, "is a plastic fluid, containing numerous molecules and colourless blood-corpuscles; and when the fluid fibrillates, it incorporates the molecules and unruptured corpuscles, forming tissue. The latter is a glairy semi-fluid tissue, con-

taining numerous molecules and colourless (mucous) globules. Mucus frequently exhibits a copious and distinctly fibrous character or structure, and always does so when a little dilute acid is added to it—an addition which cannot *form* the fibres."[1]

But, that these fibres and these corpuscles of mucus should be healthy, it is necessary that the fluid from which they are originally formed should be healthy too; and this it is not in tuberculous subjects. And precisely as in a scrofulous abscess we have tubercle mingled with the purulent matter, so it is easy to understand how, under the excitement of inflammation, there should be a deposit of the same substance with the effused mucus. It may be said, in opposition to this, that we have true mucus formed in these cases, but this is no real objection; *plastic* lymph is not unknown in phthisis. I do not contend that the secreting cells of mucous membranes cannot separate their proper fluid, when the constitution is scrofulous, but simply, that in some instances they may and do fail in educing the normal results, and that the free albumen, which Andral has shown to exist in the mucus of inflamed bronchial tubes, may be deposited in the form of tubercular matter. And this effusion appears as miliary granulations, because it is situated in the air-cells.

In these two instances the tubercle occupies the place of inflammatory effusions; in those first noticed its presence is, for the most part, independent of inflammation. But the same principles are applicable to

[1] Trans. Prov. Med. and Surg. Association, vol. xii, p. 248.

the explanation of all. In chronic phthisis the tubercle is deposited where healthy tissue should have been formed, because the nutritive processes are defective in energy, and because the materials on which the vital powers have to work are not themselves well constituted. The differences are of degree, rather than of kind. Inflammatory or not in their immediate origin, they are alike the offspring of peculiar mal-nutrition.

Nevertheless, it is of essential importance to bear ever in mind, that no other condition gives rise to such rapid development of tubercles as inflammation does; that there is no accident to be so carefully guarded against as this; no morbid process which it is more important to check at the very outset. An attack of pneumonia, of any extent, when the lungs are already occupied by tubercles, is almost certainly fatal.

As I am not writing a systematic work on phthisis, it is not necessary to enter more particularly into a consideration of the varieties of the disease, which are continually presented to our notice in practice. They involve no new *principles,* and it is with principles generally, not with specialities, that these pages are occupied.

SECTION II.

SYMPTOMS.

In the *acute* form of phthisis, using that term in the somewhat restricted sense in which it is employed in the last section, the symptoms are, in a great measure, those of the two inflammatory conditions which we distinguish by the names pneumonia and bronchitis. There are special modifications, it is true; but the general aspects are the same; the diversities being chiefly of importance, and this is no light matter, in the way of diagnosis. I prefer, therefore, rather to sketch the disease as it manifests itself in the more ordinary chronic form; because, being here in an especial manner uncomplicated, we shall have the best opportunities of arriving at just and large conclusions.

There are two principal conditions in which tubercles are found in the lungs: in the *first* they are solid, as originally deposited; in the *second*, the process of softening is commencing, or has advanced to the formation of ulcerated cavities. And the symptoms vary in accordance with these pathological conditions.

In the first stage the symptoms are those of obstruction and irritation. The evidences of obstruction are chiefly limited to the thoracic organs, manifesting

themselves in more or less dyspnœa, in diminished motion of the walls of the chest, and in impediments to the circulation of the blood through the tissues of the lungs. These last are of the gravest moment; for in them originate those frequent congestions and partial inflammations, which so greatly augment the miseries of a consumptive patient, and so decidedly hurry on the fatal termination; and in them we trace the efficient cause of one of the most alarming, as well as most common, symptoms, hæmoptysis. In the same way, too, we may have disease of the heart engendered, or effusions in the pleura, or profuse bronchial secretions, which render the cough more constant and severe, and the breathlessness more urgent.

I have called hæmoptysis one of the most alarming symptoms, and so it undoubtedly is when it proceeds to any extent, for it may endanger life immediately by the absolute loss of blood; or by producing consolidation of the lung may hasten the breaking up of its textures. But there are many cases in which (though still a matter for grave anxiety, as being so peculiarly indicative of the existence of serious disease,) it is in itself the source of present and direct benefit, by the relief it affords to congested vessels. In my experience, those cases which have made the most satisfactory progress, have been precisely of this character, and often have I seen all the pectoral symptoms abated in their violence, and the disease arrested in its progress, by the occurrence of such a timely discharge, which may with propriety, under these circumstances, be regarded

as one of Nature's curative efforts.[1] But in all these instances, it must be observed, that the hemorrhage was trifling in amount, and produced slowly. It was far too slight to cause any general debility, and far too oozing in its character to work any degree of local mischief.

The symptoms of *irritation*, on the other hand, are both local and general. Locally, they are manifested by cough, which, though usually slight at first, often a mere hacking, is more or less constant, and either dry or accompanied by thin frothy expectoration, and by various pains in the chest. These latter are irregular in their character, and are frequently absent. In many cases they are merely neuralgic, but in some they evidently depend upon partial inflammations of the pleura, or the bronchi, or the lungs. The general symptoms are more extensive, and, as it appears to me, far more important, for the local signs of irritation above noticed may exist and persist without there being any tubercular deposit whatever in the lungs. I have known a constant hacking cough, precisely analogous to that which characterises the first stage of phthisis, continue for years, the subject of it enjoying all the time perfect health, and having every prospect of main-

[1] I have much satisfaction in corroborating the statement in the text, by a quotation from Dr. Walshe's Report, just published: "Frequently-recurring hæmoptysis does not reduce the mean duration of life, after seizure with tuberculous symptoms, in any given mass of cases. It is not repugnant to reason to admit, then, that in a certain number of instances hemorrhage from the lungs may act as a local therapeutical agent."—Brit. and For. Med.-Chir. Rev., Jan. 1849, p. 253.

taining the same condition; but then the system at large exhibited no indication of morbid action.

When, however, the deposition of tubercles has commenced, or even is commencing, a very different state of matters most commonly prevails. Even if there be no marked symptoms, the patient feels that he is not well; he cannot perhaps say that he is positively ill, but he is conscious that all is not right; he has not the sensations of health; the elastic buoyancy of his frame is gone; exertion is a trouble to him; he is easily fatigued, he has not energy for work that was before a pleasure; there is a general sense of discomfort; the muscles are feeble, the nerves unstrung, the body more or less wasted. And to these negatives there are soon added positive indications of disease. The pulse becomes quick, and there is a general though irregular febrile movement. The face flushes, and the palms of the hands and soles of the feet are hot and dry towards night. There is usually some antecedent chilliness; and during the night a more or less profuse perspiration occurs. Other important organs too are affected. There is frequently gastric irritation, sometimes accompanied by sharp and obstinate pain in the stomach. The tongue is furred, with red edges and tip; there is considerable thirst; the bowels are irregular in their action, the stools often showing a deficiency of bile; and the urine is frequently turbid, depositing a copious sediment of urate of ammonia.

These symptoms are variously grouped in different cases. All are present in some, but there is scarcely

any one of them which may not at times be absent; and the severity and prominence of each depend upon individual peculiarities. As a general rule, it may be laid down, that they are all most marked, most distressing, and most rapid in their accumulation, when either yellow tubercles are deposited from the first, or when the miliary granulations pass speedily into the cheesy state.

When the *second* pathological condition to which I have referred is commencing, and much more when it has become fully established, when the softened tubercles are undergoing the process of evacuation, and leaving behind them ulcerated and extending cavities, the symptoms are commonly greatly aggravated. The hectic is more pronounced, the sweats more profuse and exhausting, the emaciation more decidedly progressive. The pulse continues as quick or even quicker than before, but has less power; the dyspnœa is often increased, and the cough more thoroughly established. The expectoration becomes more copious, and gradually changed in its character, till it exhibits itself as a mixture of pus, mucus, tubercular matter, blood, &c., the hemorrhage being in some cases violent and profuse. The symptoms of gastric *irritation* are not so frequent now, though occasionally we meet with them in great intensity, amounting even, as I have seen, to positive gastritis; but the evidences of disorder of the chylopoietic viscera are still more manifest. Diarrhœa, dependent upon inflammation and ulceration of the glandular apparatus of the intestinal mucous mem-

brane, is almost universal at some period of this stage, and is very frequently the immediate cause of the fatal result. In children especially, the mesenteric glands often share in the diseased action, and become loaded with tubercular deposits. And in some cases the peritoneum is invaded by granulations of the same matter, and the patient harassed by the continued recurrence of inflammation thus excited.

In a case that I attended some years ago, and in which there had been, for many weeks before death, constant complaints of pain referred to one particular spot of the abdomen, I found precisely in that situation, that the small intestine was surrounded in two places by bands about three-quarters of an inch broad, and studded with miliary tubercles. The calibre of the bowel was contracted at these two points, and it was evidently the passage of its contents through these narrowed parts, which gave rise to the exacerbations of pain that so greatly distressed. It is easy to understand how, by an extension of the contracting process, incurable obstruction might have resulted, and proved fatal, independently of all other lesions.

The kidneys, too, are not uncommonly involved, and become at length incapable of discharging their proper functions, and then we have anasarca added to the long list of evils. This symptom may arise, indeed, from the mere impediment to the circulation through the lungs, but then it is usually confined chiefly to the lower extremities. When the kidneys fail, it may be universal; I have seen it so extensive that

the patient, before much emaciated, acquired the bulk of a very stout man, could scarcely move a limb, and was so strangely disfigured in countenance as to be barely recognisable. In this instance the urinary secretion was very scanty, and loaded with albumen. A violent attack of diarrhœa cleared out the areolar tissue most effectually in a few days, but carried off the patient at the same time.

Ulceration of the larynx also occurs at this stage, in many cases, and is a serious and most distressing complication.

There are several other untoward events which are apt to take place in the progress of phthisical disease, hastening the rapidity of its course, and grievously augmenting the discomforts of the sufferer; as intercurrent attacks of pneumonia or pleurisy, and above all perforation of the pleura;—but on these I need not delay. The sketch above given, imperfect as it confessedly is, and as indeed all general sketches must be, is sufficient for the purpose I have in view, viz. to trace out the *common* origin of all the essential symptoms. But this belongs to the next section.

SECTION III.

ANALOGIES WITH DISEASES ARISING FROM MORBID POISONS.

In our endeavours to obtain a full and correct acquaintance with any disease, we shall usually be much assisted by tracing out its analogies with other diseases, the true nature of which has been already satisfactorily ascertained. Pulmonary consumption is, I believe, no exception to this rule; and the subject of the present section is to determine what light may be thrown upon it in this way. But since, as we have already seen, phthisis is but one special manifestation of that general disease to which the *class-term* Scrofula is applied, I shall not confine my attention strictly to it alone.

The time is now happily passed by, when to profess one's self an advocate of the humoral pathology, however modified, would have been at once to incur the stigma of medical heresy. All now fully recognise the fact, that the fluids of the body play a most important part, no less in the manifested phenomena, than in the *production* of many diseases, and that the majority: and the laws of this production have been in numerous cases investigated with no little success. We know something now of the real nature of diabetes, and of

the method by which the abnormal saccharine matter is evolved; and, as a consequence, we can treat the disease upon scientific principles. We are, at least partially, acquainted with the change in the blood in which scurvy originates, and have learned how to prevent, and how to cure, that once formidable scourge. We are perfectly cognisant of the defect on which many of the symptoms of chlorosis depend, and we have discovered the remedy for that defect. But the field is a wide one, and very much yet remains to be done.

The simplest examples of blood-infection are those in which a poison, of well-ascertained qualities, has been introduced from without; for knowing, as we then do, the previous state of the body, and the time at which the new agent was brought into operation, we can readily attribute the effects we witness to their actual causes. The familiar phenomena of a mercurial course may be adduced as a good illustration of this. After the exhibition of a certain number of doses of the medicine, we have usually a state of feverishness induced; there is a brassy taste in the mouth; the gums become swollen, tender, red, and subsequently ulcerated; there is a peculiar fætor of the breath; the flow of saliva is increased, and there is commonly some tumefaction around the lower jaw. These are evidently the symptoms of poisoning, in a modified degree; they go on, and increase, and may destroy the patient, if the remedy be unduly persevered in:—the local inflammation running into gangrene, and the bones becoming necrosed and exfoliating; or laryngeal phthisis being

produced, as in a case which came under the notice of Dr. Christison.[1]

The prolonged use of iodine, again, gives rise in many individuals to fever, emaciation, excessive and rapidly increasing weakness, dinginess of the skin, with frequent clammy sweats, increase of all the excretions, impaired digestion, feebleness of the pulse, with superabundance of serosity in the blood, and frequently violent tremors of all the muscles of the arms, and even of the trunk.

Workmen who are employed much with preparations of lead are extremely liable, as is well known, to suffer from severe colic, and a peculiar kind of palsy. The attack is usually accompanied by severe racking pains of the limbs; there is sometimes fever; the skin has a dull, dirty, cadaverous appearance, and is bedewed with irregular, clammy, cold perspiration. There is a blue line at the margin of the gums surrounding the teeth. The urine is commonly diminished, but the saliva is increased in quantity, and of a bluish colour. Dr. Todd[2] narrates a very interesting case, illustrative of the fact, that the poison is sometimes strongly attracted to internal organs. The patient, who was a house-painter, and had previously suffered from colic and slight wrist-drop, was brought to the hospital with a head affection, epilepsy, and coma. Shortly before death, the breath became peculiarly fætid. On examination of the body, the brain was found pale, much shrunken, and the gray matter of a very light colour. In the right lung there

[1] Treatise on Poisons, third edit., p. 386.

[2] Todd, Croonian Lectures on Gout, &c., p. 21.

was a gangrenous cavity, and extensive lobular inflammation, affecting the apex as well as the base of the organ. Many lobules were hepatized; others in incipient suppuration, and some were the seat of little abscesses. On chemical analysis, lead was found in great quantity in the brain, and still more abundantly in the lungs.

In these three instances the poisonous agents belong to the inorganic division of natural substances; I shall select one from the organic kingdom, and then proceed to the consideration of diseases ordinarily so called.

The use of *spurred-rye* in bread, as an article of diet, is followed by the development of peculiar symptoms, constituting what is denominated *ergotism*. Of this there are two forms. In the first, when acute, dimness of sight, giddiness, and loss of sensibility come on suddenly, and are soon followed by dreadful cramps and convulsions of the whole body, *risus sardonicus*, yellowness of the countenance, excessive thirst, excruciating pains in the limbs and chest, and small, often imperceptible pulse: these cases usually prove soon fatal, in milder cases, the convulsions come on in paroxysms, being preceded for some days by weakness and weight of the limbs, and a feeling of formication in the legs, arms, and face; in the intervals between the fits, the appetite is often voracious, the pulse natural, and the excretions regular. The disease, under these conditions, may terminate in recovery, with the appearance of scattered suppurations, cutaneous eruptions, anasarca,

or diarrhœa, or it may prove fatal by prolonged coma and convulsions.

The second form commences with general weakness, weariness, and formication. After some days, or weeks, the extremities become cold, white, stiff, benumbed, and at length so insensible, that deep incisions are not felt; there are then excruciating pains in the limbs, fever, headache, and sometimes epistaxis; and finally, the affected parts shrivel, dry up, and drop off at the joints. Healthy granulation then succeeds, if the powers of life be not already exhausted, as is the case in the majority of instances.[1]

In all these, the cause of the symptoms displayed is abundantly evident; a particular substance has been introduced into the system, and that substance works out its own specific effects; there is room neither for doubt nor for questioning. And many diseases are equally plain and simple in their rationale.

Syphilis occurs to us at once, as a fully recognised example. Whatever obscurity may hang over its primitive origin, nothing can be more completely demonstrable than that, as it now exists, its phenomena are only manifested in those patients who have become tainted with the peculiar poison; and that, under whatever special form the symptoms are developed, they all own the same unvaried cause. I need not dwell upon phenomena so familiar to every practitioner; it will be sufficient for my purpose merely to recall to mind, that, though there is scarcely any organ or tissue of the

[1] Vide Christison, loc. cit., pp. 833-4.

body which may not at times be affected, yet the poison has a predominating tendency towards certain parts, as the eye, the bones, the joints, and, most notably, the mucous membranes and the skin. I here particularly refer to what are called *secondary symptoms*, because they constitute the most marked evidences of poisoning. I would request my readers also to bear in mind, the not unfrequent occurrence of a very obstinate form of rheumatism, in patients suffering from the less serious disease, gonorrhœa.

The *exanthemata* present us with no less striking and well-known illustrations of analogous facts; and in reference to them I would merely direct attention to the occurrence of dropsy, and affections of the joints in scarlatina, to the tendency to pneumonia in measles, and to the same disease, and also to disorders of the urinary organs, in cases of smallpox.

Again, the very formidable disease, *glanders*, or *farcy*, as it appears occasionally in the human subject, affords us strong additional corroboration of the principles involved in the other examples. It is happily rare, and is invariably produced by contagion. Dr. Robert Williams, in his valuable work 'On Morbid Poisons,' has collected several cases,[1] and from these I select the following :—

A groom, who had been employed about a glandered horse, died of the disease after an illness of about fifteen days. He had fever, offensive yellow discharge from the nostrils, and numerous swellings on the head

[1] Elements of Medicine, Morbid Poisons, vol. ii, p. 378 et seq.

and limbs. "At the autopsy, on cutting into the tumefactions of the head, trunk, and extremities, they were found to be in various stages of inflammation. They were about the size of an olive, and some were white, hard, and in a state of crudity, presenting a singular granulated appearance, while others were found to be full of pus. In several instances they were closely attached to the periosteum or perichondrium. The frontal sinus contained a jelly-like secretion, and a number of granules; and on the septum narium was an ulcer, exactly like those seen in the nostrils of glandered horses, and upon it lay a cluster of granules; two or three very large white circular elevations were found, immediately below the sacculi laryngis; Mr. Youatt, who was present, called them true glanderous chancres. About an inch below the valve of the colon, for three inches in extent, over the whole surface of the mucous membrane, were white granules, exactly like those in the other parts."

In another instance, "a veterinary student, having slightly injured his hand in examining the head of a horse which had died of glanders, an ulcer ensued, with inflammation of the absorbents, and of the cellular membrane of the arm, and this was followed by symptomatic fever. After some days, an abscess formed in the opposite arm, and another on the lower part of the back. Subsequently, he became hectic, and suppuration took place in his lungs, and in one of his kidneys, and after the expiration of several months, an abscess formed successively on each knee-joint. A short time after, he died."

Again, "a healthy hackney-coachman infected a chap on the inside of the right thumb, by inserting it into the nostril of a glandered horse, to pull off a scab. In six hours he was seized with violent pain and swelling of the thumb, which inflamed rapidly. On the third day, he was suddenly taken ill, whilst driving, with cold shivers and giddiness, and said that he entirely lost the use of his limbs for seven hours. In the evening of the fourth day, he was carried to Guy's Hospital, where he lay during twenty-four weeks; superficial collections of matter forming successively in the course of the absorbents. The corresponding portions of the integument sloughed, leaving extensive ulcers, which discharged an unhealthy fætid matter.

"The glands at either angle of the lower jaw, and those of the groin became swollen, and he suffered much from pain between the eyes and down the nose, and from ulcerations of the membrana narium, attended with discharge. During the progress of the local disease he had much constitutional illness. He totally lost his appetite, and was oppressed with nausea, complained of severe pains with swimming in the head, and occasionally wandered in mind; he had also much pain throughout the whole course of the spine, especially in the region of the kidneys. His urine was thick, discoloured, and fætid. Expecting to die, he quitted the hospital, and lay at home the remainder of the twelvemonth, in a state of great emaciation from the continued discharge of his sores, his inability to take food and to procure any refreshing sleep, even

with the assistance of opiates, which he took habitually. Despairing of aid from the profession, he applied to an experienced female practitioner, who administered a decoction of herbs, which he invariably vomited, but to which he nevertheless ascribed his recovery. At the end of the twelvemonth, his health gradually returned, the arm began to heal, and he became comparatively hearty, and resumed his occupation, though with much inconvenience, owing to the distortion of his hand by the retraction of his thumb and forefinger in the cicatrization of a long line of abscesses reaching to the middle of the upper arm. After six weeks this cicatrix ulcerated afresh, and healed slowly. At the end of two years and a half he still continued subject to wandering pains in the head, both sides of the neck, loins and groin, and felt that his constitution was broken."

In another case, which proved fatal in about nine months, and in which, throughout the whole course of the disease, there was no discharge from the nostrils, no affection of the absorbent glands, and no abscesses in distant external parts (the finger was the seat of injury), on post-mortem inspection, "the left parotid and sub-maxillary glands were found indurated and adherent to the lower jaw, their substance was thickly studded with numerous small collections of pus, varying in size from a pin's head to a split pea, and around these collections the substance of the gland was highly vascular, and presented a bright red appearance: of the two glands, the parotid was the most affected.

The alæ nasi were livid, and had almost passed into a gangrenous state. Numerous tubercular elevations, which could hardly be said to have passed into a state of ulceration, were seen on the mucous membrane of the nares. The mucous membrane lining the larynx and trachea were much injected, and an ulcer was seen on it just below the rima glottidis. Several small tubercles were seen at the apices of both lungs, which Mr. C. Clarke stated were precisely similar to those occurring in the lungs of horses which had died of farcy or glanders; certainly they were different from the ordinary tubercles found in phthisical subjects. The spleen was enlarged to three or four times its natural size, probably the effect of former disease, but in its substance there were found several small collections of pus. There was also a puriform deposit within, and in the course of the splenic vein, especially where it emerges from the substance of that organ."

The nurse who attended on this patient took the disease from him, and died after a short illness. I have quoted the case chiefly because the absence of inflammation of the absorbents and of external abscesses, shows that the disease did not spread by simple extension, and that the morbid lesions resulted from the general contamination of the system. The *application* of these facts will appear afterwards.

Effects, closely resembling these in their general aspect, but differing in their specialities, result from the absorption of animal poison through wounds, &c., received in dissection. There is severe fever with

extreme prostration, coated tongue, disturbed alimentary functions, and frequently various nervous symptoms; and as the disease advances, abscesses are often formed in various parts, remote from the original wound, and often on the opposite side of the body. It is also specially observable, that, in the severest form of the disease, the inflammation in the punctured part is slight.

Let us take again a very analogous illustration from a class of affections still more common than the last. A man undergoes a surgical operation; for some days all goes on favorably, and then, suddenly, and without apparent cause, he has severe, long-continued, and frequently-recurring rigors. These are succeeded by fever, of greater or less intensity, and accompanied with restlessness and anxiety, great collapse of features and depression of spirits, and much prostration of strength. Sometimes there are sickness and vomiting, and he complains of pain in the chest, or abdomen, or joints, and is overwhelmed by an unaccountable feeling of oppression. The skin has now a sallow or even jaundiced appearance, the pulse becomes weak and rapid, the tongue brown and dry, and he gradually sinks with all the symptoms of typhus; the wound in the mean time showing no tendency to heal.

On examination after death, abscesses are found in the lungs, the liver, the spleen, the kidneys, the joints, or the heart; or the serous cavities are filled with unhealthy purulent effusions; or there is matter in the subcutaneous areolar tissue. Sometimes there are

evident marks of inflammation around these deposits, but very often the neighbouring tissues are perfectly healthy and unaltered.

The same train of symptoms and the same morbid conditions may follow severe injuries, or be developed after parturition; and, without entering upon the disputed question of the precise method of their production, it may be confidently affirmed, that they result from the poisoning of the blood with purulent matters, for they are only observed when there exists, somewhere or other, a suppurating surface of greater or less extent. It is also a well-established fact, and most important in regard to our present argument, that these secondary deposits are most common in the lungs, and next to them in the liver. Precisely the same occurs in cases of secondary carcinoma; and there is one other striking point of similarity between the two classes, viz., that the deposition or arrest, as it may be, of a single germ of pus or of cancer in any part, is surely followed by the accumulation of more in the same locality, that which is first placed serving as a nucleus of attraction to the others.

Dr. Ferguson[1] has shown, that the essential cause of puerperal fever is the absorption of decomposed or unhealthy secretions by the inner surface of the uterus, that surface being, after parturition, in the most favorable condition for the occurrence of such absorption. In some of these cases, the symptoms resemble those of an attack of acute rheumatism so closely, as to have

[1] Essays on the most important Diseases of Women, vol. i.

led to mistakes between the two affections; and Dr. Todd employs this fact as an additional argument in favour of the view he has adopted, regarding the true nature of rheumatism, viz., that it is dependent upon the circulation of an animal poison in the blood. It appears to me that he has established this point most conclusively, but it would lead into an inconvenient length of digression from our main subject if I were to bring forward the many proofs adduced. I shall content myself with the quotation of his description of the *rheumatic diathesis*, which appears especially applicable to our present purpose, from the resemblance it bears in many respects to those indications which we have already noticed as belonging to the strumous constitution.

"This state," he says,[1] "as far as my observation enables me to judge, occurs chiefly in children and persons under the age of thirty; rarely beyond that period, excepting as the consequence of the existence of the diathesis in early life. It is characterised by the existence of a febrile state of the system, variously developed in different individuals, and indicated by quickness of circulation, occasional exacerbations evinced by heat of skin and perspirations more or less profuse; the perspirations having a sour odour. The urine is prone to the development of lithic deposits, more or less coloured. These symptoms, however, often escape the patient's observation (although readily detected by the attentive practitioner), and his chief com-

[1] Croonian Lectures, p. 109.

plaint is of pains in the joints, not always occasioning swellings or enlargements, but often impeding motion; pains also in the muscles, or in the course of the nerves of the limbs; not stationary, but now affecting one limb or joint, and again another. . . . . This diathesis is also further distinguished by evident marks of imperfect or deranged nutrition. There is great pallor of the skin, a cachectic appearance; a greenish or yellowish hue tinges the surface, and the red particles of the blood are deficient; the patient is thin, indisposed for business or amusement; the appetite fails, and some thirst is felt. The patient is keenly sensitive to vicissitudes of temperature. . . . . In this state of constitution the heart is apt to become affected; and the constitutional disturbance consequent upon this lesion may often be the first circumstance to excite the attention of the patient or his friends. The pericardium may be, and no doubt often is, the seat of this affection; but it has appeared to me, that in the diathesis, the endocardium and the valves of the heart more frequently suffer."

I shall conclude this very slight and cursory sketch of the chief diseases which originate in morbid poisons, by calling attention to the very frequent occurrence of inflammation and ulceration of the mucous membrane, and glandulæ of the intestines in continued fever; and to the fact that intermittent and mild remittent fevers are often accompanied with affections of the liver, spleen, lungs, brain, and heart, and of the serous, mucous, and areolar tissues of the body generally.

Reviewing, now, what has been written above, one cannot fail to be struck with the great general resemblance which prevails throughout the entire series of examples. They are, plainly, members of the same natural family, differing, as individuals will do, in particular details, and in special combinations, but having so many features in common as to show that they spring from the same stock. Fever, we find, is almost universally present, though in varying degrees, and of diversified character; the body is emaciated; the digestive functions are more or less deranged; there are pains in the limbs; the skin is seldom natural in appearance, and its functions are perverted; the pulse is small; the whole system weakened; the secretions and excretions depart more or less widely from their normal characteristics. And then, we have organic changes in many organs; the eye is often affected; the larynx inflamed or ulcerated; pustules or abscesses form in the integuments, and the subjacent areolar tissue; the brain is not uncommonly diseased; the bones, and particularly the joints, suffer severely; the mucous membranes are greatly influenced; while the important depurating viscera, the kidneys, the liver, and the lungs, are, in a peculiar manner, liable to destructive alterations.

Are not the phenomena of scrofula, in general, and of phthisis, in particular, closely analogous, I would almost say identical? Let us investigate this point, for it is one of no small or doubtful importance, practically, as well as in reference to theory.

The occurrence of fever in phthisis is almost universal. Slight at first, and irregular, it gradually increases in severity as the disease advances, until it puts on the complete form of confirmed hectic. It is undoubtedly not dependent on inflammatory action, for it is present in cases where, from first to last, there is no inflammation; nor has it the persistent character of the constitutional disturbance thus excited. But it does bear a marked resemblance to the fever which depends upon the absorption of the paludal poison, both in its periodic accession, and in its special phenomena. It comes on chiefly towards the close of the day; there is antecedent chilliness, which may even amount to shivering; the general surface is cold and constricted; the nails often blue, and the skin rough. This gives way to flushing of the face, and burning heat of the palms of the hands and soles of the feet. The whole body then becomes hot; the pulse is quickened; there are thirst and restlessness; until, towards morning, the excitement passes off by perspiration, more or less profuse. But the patient is not thereby relieved to the same extent as in ague; he is more comfortable in his general sensations, but the loss occasioned by the sweating leaves his system weak and languid; and each repetition only increases the evil. The poison cannot be thus thrown off.

Emaciation, again, is rarely absent. In some cases it appears earlier, in some later, and it is subject to great variations in the progress of a single case. But in the vast majority it is a prominent and unmistakable

symptom. I have already alluded to the rationale of its production.

No less clear is the evidence of derangement in the digestive functions. We have seen that in the first stage there is commonly some measure of gastric irritation, and that in more advanced periods we have the indications of impaired activity of the chylopoietic viscera in the frequently-recurring diarrhœa, and the increased marasmus. Indeed, so common and so important are these dyspeptic manifestations in scrofulous subjects, that they have been regarded by many as the true origin of the disease, and by others as the most essential element of the strumous diathesis. I would specially direct attention to the admirable article in the 'Cyclopædia of Practical Medicine,' by the late Dr. Todd, as containing the best account we possess of the *strumous dyspepsia*, observing, merely, that it appears to me to belong rather to the formed disease than to the diathesis.

Pains in the limbs are frequent both in phthisis and in the general scrofulous condition, but they rarely have the severe racking character so common in the examples above quoted; they consist rather of a dull, aching sensation.

The unnatural condition of the skin is a well-marked symptom in phthisis. Cold, clammy, partial sweats, coexisting with a state of general harshness. In scrofula, eruptions, of the dry, scaly kind, are especially common, and obstinate in their resistance to treatment.

The pulse is almost universally small and feeble. I

have met with exceptions to this rule, but they are very rare.

It is needless to say that a weak state of the entire system is one of the most invariable concomitants, being frequently, too, the first circumstance that attracts the patient's attention, and excites his alarm.

Nor is it less manifest that the secretions and excretions are altered from their natural qualities. The change in the former is indicated chiefly by the dyspeptic derangement; that of the latter is palpable to our senses. In the early stages of phthisis, the evacuations usually show a deficiency of bile; afterwards they are altered in various ways, and to various degrees of unhealthiness. The urine is very commonly loaded with deposits of the lithates. I have seen it containing large quantities of very deep-coloured purpurates; and the analyses of Becquerel show that there is an increase of uric acid.[1]

Such are the *functional resemblances;* sufficiently close in themselves to lead to the suspicion that the fundamental causes of the two classes cannot be very different in their nature; and this suspicion will, I apprehend, be converted into something very like certainty, when we advance to the next stage in our inquiry, and investigate the localities of the morbid structural changes.

The frequency of inflammation of the eye in scrofulous subjects is well known, and many surgeons regard it as a distinct and specific disease. This is

[1] Simon's Chemistry, vol. ii, p. 287.

probably a mistaken opinion, but the fact remains the same, and it is strikingly in accordance with the results noticed in our foregoing sketch of morbid poisons.

In 190 cases of phthisis, in which the parts were carefully examined by Louis,[1] the trachea was found ulcerated in 76. In 193 cases the larynx was ulcerated in 63; and there was the same affection of the epiglottis in 35 out of 135 cases. It is usually believed that these ulcers are caused by the irritating qualities of the sputa, and their position on the posterior aspect of the organs, appears to give some support to this view. But it is quite clear that such is not the only cause, otherwise they would be more invariably present. Besides, as Louis correctly remarks, they are not always proportional to the acridity of the sputa, nor do they always exist when the pulmonary disease is extensive, and the lung the seat of cavities of long standing. Moreover, they are more frequent in males than in females, and it remains yet to be proved that there is any difference in the characters of the sputa in the two sexes. Be this as it may, we have here an additional analogy.

It is scarcely necessary to refer to the resemblance which prevails in regard to affections of the absorbent glands, and the existence of subcutaneous abscesses. Everybody knows that they are among the most common indications of scrofulous disease. Mr. Phillips even believes that they are essential to the very being of scrofula; that they constitute the one pathognomonic

[1] Loc. cit., pp. 42-3.

sign, without which the disease is not. I demur to this opinion, for reasons already stated, but fully recognise the importance of the fact itself, and find in it another and strong confirmation of my views.

The same may be said in regard to diseases of the bones and the joints. The most numerous, and at the same time the most obstinate cases of this kind, are furnished by scrofulous subjects. It is quite unnecessary to enter into details.

The researches of Louis, again, prove conclusively that the contents of the cranium are often variously affected. "The cerebral arachnoid," he says, "had very frequently undergone partial thickening, and exhibited non-tuberculous granulations, in greater or less number, at its upper part, more especially in the neighbourhood of the falx. It was invested, in two cases, with a yellowish false membrane. The tissue, uniting it to the pia mater, was infiltrated, and the lateral ventricles distended with a notable quantity of serosity in three fourths of the cases. The same kind of fluid appeared, but in less quantity, with somewhat less frequency also, in the lower occipital fossæ. In some cases the sub-arachnoid tissue, especially that in the fissure of Sylvius, was the seat of a greater or less number of gray semi-transparent, or actually tuberculous, granulations. The brain was more or less injected with blood in one seventh of the cases; in one twentieth of them its consistence was diminished throughout, and in one instance more especially, to a

[1] Loc. cit., p. 151.

very remarkable amount. It was affected with partial pulpy softening in the same proportion of cases; and in a small number of instances contained tubercles."

Many, perhaps the majority, of these changes are not peculiar to phthisis, being found in those who have died of various other diseases, and especially in the victims of typhus; but this acknowledged fact in no way damages the argument I am endeavouring to build up, and which rests for its foundation, not on the *specific* nature of the morbid lesions in all the different organs, but on the *frequency* of the implication of these organs. There is no apparent difference between the serosity effused in the arachnoid of a typhus subject, and that which is found in the head after a fatal dose of opium, and yet the two poisons which produced the effects are essentially different. The inflammation of the lungs which exists in some cases of poisoning by arsenic, is not distinguishable from the pneumonia of measles.

It is singular that, while these organic alterations in the cranial contents are so frequent, cerebral symptoms should be so rare in the progress of phthisical disease. In the vast majority of cases, the mental functions remain unclouded to the end, and the brain gives no evidence of any disorder. There are exceptions, however. One of the very worst cases of epilepsy I ever met with, occurred in a young lady whose lungs were extensively affected with tubercular disease. A few years ago, I was attending a gentleman, who died of chronic phthisis. There was nothing peculiar in the

case, and no indication of serious disturbance in the nervous system. His mind was more than calm at the prospect of death, of the near approach of which he often spoke, openly and cheerfully. Some days, however, before that event really took place, he became excited and nervous,—a change which was attributed by his friends to small opiates taken at night to procure sleep. The remedies failed, even when given in full doses, and there was perfect agrypnia for some days. He then became delirious for a time, and subsequently comatose; and while thus insensible he was affected with the most horrible clonic contractions of the muscles of the trunk and limbs and face I ever witnessed. The features were rigidly immoveable, the lips retracted, the eyes wide open, and fixed in a ghastly stare of intense horror, which was absolutely terrific. Unfortunately there was no opportunity of examining the head.

In another case, that of a young boy, who had tubercles both in the lungs and in the mesenteric glands, hemiplegia came on a few days before death. But to return to our more immediate purpose.

The extreme frequency of affections of the mucous membranes in phthisis is well known, and of great importance. On this point I quote again from Louis. "In one twelfth part of the cases the stomach was very much distended, and carried lower in the abdomen than natural; its mucous membrane was red, sometimes mammillated, slightly softened and thickened, on the anterior surface, in about the same proportional number

of cases. In a fifth part of those examined it was softened and attenuated, within a variable extent, and in the same number of individuals it was found extremely red, softened, and sometimes thickened at the fundus; ulcerated, and more or less grayish and mammilated in many others, &c. It was perfectly healthy in but one fifth part of the cases.

"Five sixths of the bodies examined presented ulcerations, varying in number and size, in the small intestine. They were of almost as frequent occurrence in the large intestine, and the mucous membrane of this portion of the alimentary canal, frequently coloured red, and thickened, was as soft as mucus throughout the entire, or a great part, of its extent in one half of the cases. I found it perfectly healthy from one end to the other in but three cases."[1]

The kidneys did not suffer to the same extent. They were found tuberculized only in about one sixth of Louis' cases. In about a fourth of the whole number, they were redder and of harder consistence than natural. In one case, this organ had undergone the fatty degeneration. Other observers, Dr. Christison among the number,[2] have noted the occurrence of granular degeneration of the kidney during the progress of phthisis pulmonalis, and it is well known that a scrofulous state of the constitution powerfully predisposes to that urinary disease. In the case of anasarca, to which I have alluded above, the urine was highly

[1] Loc. cit., p. 149.

[2] Library of Practical Medicine, vol. iv.

albuminous from the first commencement of the dropsical symptoms; and I have no doubt the kidneys, if examined, would have been found affected in the manner of which we speak.

On the other hand, the liver is very often, and in a very remarkable way, affected. Louis found it fatty in one third of his cases. Out of sixty-five persons who died of phthisis in the Edinburgh Infirmary, Dr. Home found it fatty in ten, and waxy in five more. In some cases of scrofula, when the patients have been much wasted by disease of the bones or of the glands, the liver has been found enlarged, and presenting a peculiar appearance, on account of which Rokitansky has given it the distinctive appellation of "lardaceous liver."[1] The condition appears to depend upon the infiltration of the organ with "a compact, grayish, often transparent, albuminous, lardaceous, or lardaceous-gelatinous substance," the chemical nature of which is not yet known. And it is interesting to observe that an enlargement precisely analogous to, if not identical with, this has been observed in persons whose health is broken from the combined influence of mercury and syphilis, as was first distinctly noticed by Dr. Graves.

Let us pause for a moment, and reflect upon this fact, for surely it is most significant. We have a general disease of the system, scrofula, exerting its chief influence on the bones, or on the glands, and drawing in its train a serious organic alteration of the liver. We have a man suffering from another disease,

[1] Budd, on Diseases of the Liver, p. 247.

and from the abuse of a powerful medicine; his bones, too, are affected, and his liver becomes involved in a precisely similar way. The *causation* of the latter is not doubtful; neither bones nor liver would have been diseased as they are, but for the presence of a double poison in his system. Why should we hesitate to attribute like effects to a like cause in the former? I confess I can see no reason. The matter appears to me intelligible on this supposition, and on this alone.

The occurrence of fatty liver in the human subject is not absolutely confined to phthisical cases, though they furnish the vast majority of examples. Dr. Budd, in the very admirable work already quoted, has recorded one in which it was found in a very marked form, in the body of a man who died of extensive cancerous ulceration of the groins. Here it clearly depended, not upon the specific action of the cancer-cells themselves upon the liver, for that organ contained no carcinomatous deposit, but upon the general contamination of the system.

Louis only found the liver tuberculous in two cases. Dr. Budd has seen it studded with tubercles in several natives of the South Sea Islands, who died in the Dreadnought of phthisis; and M. Reynaud states that the liver is frequently thus affected in monkeys. But they all agree in stating that they have never found tubercles and fatty degeneration coexisting in the same organ.

It is palpably needless to insist on the frequent implication of the lungs; I will merely recall to mind

the well-known result of Louis' very extended observations, viz. that, in individuals who had passed their fifteenth year, he never observed tubercles in any viscus, without finding them likewise in the lungs, and that, with the single exception of one solitary case, he always found the tubercular deposit in a state of greater advancement in the lungs than elsewhere.[1]

Our comparative sketch is thus concluded; and it appears to me impossible to read what has been written without being powerfully impressed with the striking resemblance which obtains between the two series of morbid actions. There are the same extensive functional disturbances—the fever, the profuse unhealthy sweats, the disordered secretions, the emaciation, the prostration—and the same wide-spread organic alterations. Must not the causes of effects so similar, be themselves similar? Must they not, to say the very least, have something common in their nature? I believe that this is really the case, and that scrofula, with its highest and most formidable manifestation—phthisis, is as much a poison-disease, as any of those others with which we have been concerned in the former part of this section. I believe that the observed phenomena depend upon the circulation of a peculiar specific *materies morbi* in the blood, and that the tubercle itself results from the special modification of nutrition induced by that particular poison, and by that alone.

[1] Loc. cit., p. 153.

No one doubts now that cancer is the resultant of a pre-existing general contamination, or imagines that it can be produced when that contamination is not. And why have they arrived at this conclusion? Simply because of the thousands exposed to the exciting causes, a few, and a few only, become thus affected. Scirrhus of the lower lip appears to originate, sometimes, from the irritation caused by the pipe; but millions smoke every hour of every day, and retain their lips intact. Blows on the female breast are common enough, but the number of carcinomatous mammæ thus produced is vastly inferior.

Precisely in the same way, fever, and emaciation, and prostration of strength, and absolute inanition, may occur, and do occur, in countless cases, where tubercle from the beginning to the end never makes its appearance. The marasmus in phthisis, extreme though it be, is surpassed by that which we observe from scirrhus of the stomach, and yet in the latter disease we never find tubercles. A man may be reduced to a mere skeleton, and die of absolute starvation, from total inability to digest his food, or from its unwholesome nature; and yet, though nutrition is here entirely suspended, the peculiar morbid product of which we are speaking is not evolved. While, in another case, the body still remaining comparatively well-nourished, and the digestion proceeding to all appearance with due regularity, the lungs or other organs contain it in abundance.

Again, tubercle, wheresoever found, presents the

identically same characters. Take it from what part of the body you may, and when examined by the microscope, it will be found to consist of the same elements, the only difference being in the intermixture of the proper tissues of the part. This is inconceivable, if we suppose it to be nothing more than an imperfect form of the natural elements, a half-generation, if I may so call it, of the healthy texture. It is quite conceivable that nerve-tubes may not be completely developed, and so fail in the exercise of their proper function; or that bone-cells may not elaborate a right secretion, and the structure which they build up be thus abnormally constructed. But it is hard to understand how the arrest, or the imperfection of these ordinary vital workings, should educe a structure totally different from the natural ones, and absolutely the same in two such diverse localities, unless there be some one special influence brought to bear on both alike.

Yet again. Tubercle is often coetaneously deposited in many parts of the body, as is evidenced by its being found there in precisely the same stage of progress. Louis relates an interesting case of this kind, in which there were crude tubercles in the same stage of development, in the neck, the right axilla, the mesentery, the loins, the spleen, the brain and the cerebellum; and he very justly remarks,[1] "I really do not understand how this fact can be accounted for, unless by admitting the agency of one and the same

[1] Loc. cit., p. 144.

cause, acting at one and the same time upon all these parts."

But let us look a little more closely into some portions of the evidence brought before us. We have seen that in poison-diseases, properly so called, and in the morbid actions excited by the ingestion of deleterious substances, certain organs of the body are specially liable to become affected. Does there appear to be any principle presiding over this election?

In the first place, it may be laid down as an axiom, that there is a natural tendency in the living body to get rid of matters which would prove injurious if retained; and that, whether these matters have been introduced from without, or generated within. Of the former, we have a familiar example in the spontaneous diarrhœa, which so commonly relieves the system from the effects of errors in diet; of the latter, in the saccharine urine of diabetes, and the critical discharges of urates and uric acid in many diseases, where these substances are formed in excess. We have proofs of the same kind in regard to various medicinal agents, and sometimes the rapidity with which this process of elimination is set up is very remarkable. For instance, in an experiment of Mr. Erichsen's, a dose of forty grains of ferrocyanide of potassium being given, this substance was detected in the urine in two minutes, and continued to present itself for some time.[1] Wöhler

[1] See a very admirable article on Poisons, in the Brit. and For. Med.-Chir. Review, vol. ii, p. 190 et seq., to which I am indebted for this and several other facts.

found in the urine of dogs and horses, iodine, sulphuret of potassium, sulpho-cyanide of potassium, the salts of nickel, the oxalic, tartaric, citric, malic, gallic, succinic, and benzoic acids. Arsenic and tartarized antimony have been detected in the urine by Orfila and others; and the first-named celebrated chemist believes that the kidneys are the organs by which the former poison is most readily eliminated, while, on the other hand, MM. Danger and Flandin assert, that it escapes by the liver, the lungs, and the skin. Mr. Herapath found arsenic in the liver, in a case in which he failed to detect it in the contents of the stomach and intestines. Traces of the same poison were procured also from that viscus by Dr. Taylor, and he discovered the existence of lead in the milk of a cow, that had accidentally swallowed a quantity of the carbonate of that metal. MM. Danger and Flandin have ascertained that the salts of copper, when taken as poisons, are more readily detected in the bronchial secretion than in the urine. Iodide of potassium has also been detected in the salivary, mammary, and cutaneous secretions.

Some organic substances have, in like manner, been found in the secretion of the kidneys; and we have a remarkable example of the presence of an active principle in that fluid, which chemistry cannot detect, in the new properties acquired by the urine of those persons who have eaten an intoxicating fungus, the *amanita muscaria*, which is employed by some of the inhabitants of north-eastern Asia, in the same way as other nations use alcoholic drinks. "If a man," I quote from the

review to which reference has already been made, "who has been sobered by sleep (or rather by the elimination of the poison *during* sleep), take a cup of his urine the next morning, he will be more powerfully intoxicated than he was the preceding day; and we are told that it is not uncommon for confirmed drunkards to preserve their urine as a precious store in the event of a scarcity of the fungus. We are further assured, that, by a repetition of the same act, the intoxicating effect may be kept up for a week or more; showing, that the use of the same substance, over and over again, has the same effect as the introduction of a fresh dose. And this is true, not merely as regards each single individual, but also with respect to the transmission of the agent from one individual to another; for we are assured, that if a second person drink the urine of the first, the third that of the second, and so on, the intoxication may be propagated through a party of five,—perhaps unlimitedly. Hence, it can scarcely be questioned, that the active principle of the amanita passes either unchanged, or in some state of combination that does not affect its properties, into the urine; and it is further obvious, that its elimination by the urine is the cause of the cessation of its peculiar influence upon the nervous system. Dr. Letheby has obtained results of the same order in regard to opium, belladonna, hemlock, aconite, &c., the elimination of which by the urine was proved by the production of the characteristic effects of these poisons, when that fluid was administered to other animals."

In his Essay on Poisoning by Alcohol, Dr. Percy has shown that that fluid can be procured after death from the brain, the liver, the blood, the bile, and the urine.[1]

Nor is it necessary, for the obtaining results of this nature, that the agent should be introduced by the stomach, for, as I have shown elsewhere, iodide of potassium can be detected in the urine after its application to the sound skin.[2]

Now, in all these instances, it is plain that the great depurating organs of the blood form the channels through which the various substances are removed from the economy, and it is precisely these organs which are affected in the diseases we have been considering. May we not draw some legitimate inferences from this fact? May it not be that the local changes observed are caused, either by the action of the morbid poison itself upon the parts to which it is derived, or by the undue activity of those parts in their efforts to eliminate the offending matter?

For example: The presence in the blood of the peculiar poison of lepra gives rise to a certain, and often a considerable amount of constitutional disturbance; but as soon as it is localized in the skin, there producing the specific eruption, these general symptoms are greatly diminished, if not entirely dissipated. The system has got rid of the morbific agent, but in its progress outwards it specifically modifies the nutrition of its proper channel of elimination.

[1] Taylor, Medical Jurisprudence, p. 16.

[2] Essay on Cutaneous Absorption, p. 104.

The history of the exanthemata presents us with analogous facts, and it is matter of universal observation, that the worst forms are those in which the vital powers are not sufficiently energetic to throw out a copious eruption. It is also worthy of notice, that dropsy more commonly follows those cases of scarlatina in which there has been a slight and evanescent cutaneous rash; and the explanation is to be found in the fact, that, under these circumstances, there has been an imperfect and inefficient elimination of the poison by the skin, the remaining portions manifesting their presence by the development of the secondary symptom in question.

The abdominal complication in typhus fever appears most intelligible upon a similar principle. It is probable that the natural function of the intestinal glandulæ is the excretion of the *putrescent* results of the decomposition of the solids and fluids of the body. In typhus there is a special tendency to such putrid decompositions, and hence the peculiar fætor of the stools, and hence also the beneficial influence of moderate diarrhœa in the earlier stages of the disease, by which these unhealthy matters are freely carried out of the system. But, when the poison is in excess, and its general operation is long continued; this very conservative process may give rise to local and serious mischief. It is well known that when the functional activity of any organ is exalted, the circulation through that organ is in like manner quickened, and the quantity of blood there present increased; in fact, there is a species of hyperæmia, and this may easily enough degenerate into inflam-

mation. Such an event is specially liable to occur when the stimulus is in itself peculiarly irritating, or when it is too continuously applied, and both of these conditions are present in typhus. We have evidence of the irritating qualities of the poison in the fever which its presence produces; we know that its application must be continuous from the persistence of the disease itself. It is not, therefore, wonderful that the glands thus roused to undue activity, and thus perpetually stimulated by an abnormal agent, should become inflamed and ulcerate,—a process which, in more favorable circumstances, would be a means of preservation, being in this way converted into a new and formidable source of danger.

Is not the frequent occurrence of diarrhœa in scrofula an illustration of the same general law? Is it not, in many instances, the result of a natural effort to expel the morbid poison? Excepting, of course, all those cases in which it is produced by the direct irritation of improper food, or diseased secretions poured into the intestinal canal from contiguous viscera, and especially from the liver. And do we not see, in the tubercular deposit in the glandulæ, and their inflammation and ulceration in phthisis, occurrences precisely similar in character to those which take place in typhus? I conceive that the resemblance is most perfect, and that if we are right, in the interpretation given above, of the latter phenomena, we are shut up to an analogous explanation of the former.

Very much the same may, perhaps, be said of the perspirations in consumption. They are attempts, but

ineffectual ones, to remove the poison and its results. Of this, other diseases afford us analogous examples. The phenomena of intermittents clearly evidence the struggles of the system to free itself of that which is injurious; and they are partially successful, for the relief afforded by the sweating is most decided, though it be but temporary, the poison accumulating again in the course of a few hours. In rheumatic fever the same occurs, and the analogy with phthisis is more complete, while the *nature* of the cutaneous discharge is also more satisfactorily manifest. For the diseased qualities of the secretion are clearly indicated by its peculiarly sour smell, and the excess of free lactic acid which it is known to contain; and the incapability of a perfect elimination by this channel is made plain by the universally recognised fact, that the pains are not thus relieved, however copious the secretion may be.

Nor do I think that we shall go very far wrong if we apply a somewhat similar principle of interpretation to the occurrence of fatty liver in phthisis. The liver, we know, is the most important organ by which hydrocarbonaceous matters are carried out of the economy. Mr. Bowman has shown that oil-globules are normally present in the secernent cells. When the viscus is affected in the way of which we are speaking, these globules are greatly increased in number and in size,—they distend the cells almost to bursting. It is clear, therefore, that the abnormal condition is dependent upon an excess of a natural ingredient. How is this excess produced?

The method adopted in France to make the livers of geese fatty, throws some light upon the subject. Baron Larrey describes the process as follows:—"To procure the large livers of geese, for the making of patties, fatted birds are confined in close cages, and then exposed to a graduated heat, being kept at the same time entirely without food, even without water. They become feverish, the fat undergoes a kind of fusion, and the liver grows enormously large. The liver is considered to be in the desired state when the animal is extremely wasted, and the fever increases."[1] Here it is evident that the fat in the liver is derived from that which had previously existed in other parts of the body, and which had been absorbed as the general emaciation went on; and it is worthy of remark, that the cases, not phthisical, in which this condition has been observed, are all such as were characterised by excessive wasting. Consequently, it is not unreasonable to infer that we have, in this, at least a partial explanation of the phenomenon—that the liver is fatty by reason of the removal of the adipose matter from other parts of the system.

But that this explanation can only be partial will at once appear from a consideration of the comparative infrequency of the morbid condition in question, excepting in cases of phthisis. If the simple absorption of fat were enough to account for its development, it would be constantly found in diseases which are at-

[1] Budd, loc. cit., p. 237.

tended with much emaciation; and this, experience disproves. We must, therefore, seek further.

Now, it is specially observable, that when fatty livers have been discovered in individuals not affected with tubercle, they have either been the subjects of some blood-disease, as cancer, or pemphigus (according to the observations of MM. Biett and Rayer), or have had suppuration going on extensively in some part of the body, as in several recorded cases of chronic dysentery. We have also seen that the presence of fat, abnormally, in any tissue, is evidence of a process of degeneration, of a descent from a higher to a lower position in the scale of vitalized substances, and that, therefore, its existence in tubercle is one of the many proofs that that morbid product results from mal-nutrition. Bearing these things in mind, and remembering that the one common characteristic of the diseases in which this local alteration is observed, is that of generally depressed organic powers, we shall, I conceive, see reason to believe that the fat is not solely derived from the natural adipose textures, but is also, in part, the result of imperfect nourishment throughout the entire system.

And, if this be true, the lesion we are examining will be brought under the same general law as those with which we have been already occupied, in this way.—The specific poison acting at all parts interferes with the healthy elaboration of every tissue. Asa consequence of this, fat is found in excess, and where it does not naturally exist. This fat, absorbed into the blood in large quantities, is laid hold of by the hepatic

cells, which have a natural affinity for it. It is taken up by these for the purpose of excretion, but the supply is greater than the demand, and it therefore accumulates in the new position. There is here a perfect analogy with that which we have supposed to occur in the intestinal glandulæ.

One other point remains for our investigation. Can we, upon the principles advocated in this section, explain the very remarkable fact, that tubercle is infinitely most common in the lungs? I conceive it may be done in two ways.

It appears that morbid matters in the blood (excluding from this inquiry those which are introduced from without) consist of "organic compounds, or such among inorganic as are incidental to the human body;"[1] and that they may be generated either during the process of digestion, or in the various acts of assimilation, disintegration, and secretion, which occur in all parts of the body. Assuming that the latter is the most probable,—and it is supported by many considerations, and particularly by the persistence of the abnormal formative process under every change of diet,—it follows that the unhealthy matter thus produced, though in part carried by the vena portæ to the liver, must be conveyed in much larger proportion through the blood of the venæ cavæ directly to the lungs. The vital fluid, thus poisoned, is here subjected to the great depurating process of respiration; and, if there be any truth in

[1] Dr. W. Budd on the Symmetry of Disease, Med. Chir. Transactions, vol. xxv, p. 142.

what has been stated above, we might even have anticipated what we know to be the case; and can, at any rate, readily understand how, in the process of elimination here, the poison should exert its specific modifying influence on the nutrition of that organ by which it is being cast out. Precisely as we have already observed to take place in skin diseases. And the explanation will even hold good on the supposition of the morbid matter being generated during digestion, provided only it be conveyed with, or first act upon, the chyle; of which we have some evidence in the frequent occurrence of mesenteric tubercle.

This is one way in which we may account for the phenomenon; but another, and perhaps more satisfactory, interpretation may be found in the general law, according to which particular substances are attracted to, and retained in union with, certain organs and textures of the body. Of this we have familiar illustrations in the action of mercury upon the glandular system, of diuretics on the kidneys, of narcotics on the brain, &c.; the peculiar effects of all these medicinal agents depending upon their local presence in the organs, whose functional activity, and therefore whose nutrition, they variously modify. Lead also affords us a very notable example, and one that is of special interest in reference to our present inquiry, because its effects are so remarkably localized. I refer, of course, to the partial palsy which constitutes the wrist-drop, and which is clearly produced by the retention of the poison in the nerves and extensor muscles of the hand,

for it has been detected in these parts after death. And the strength of this peculiar attraction is signally manifested in the well-known tendency of arsenic to produce inflammation of the mucous lining of the stomach, however it may be introduced into the system; so that this effect is as sure to follow poisoning by that metal applied to the external surface, as when it enters by the more ordinary channel.

In disease we have abundant proofs of the same kind; as, indeed, we have already seen, and need not here repeat.

With all this evidence, then, before us, it appears to me something more than a mere imagination to assume that phthisis constitutes another illustration of the same great principle, and to believe that the reason why the lungs are so generally and so early invaded, may be in part found in the existence of a special affinity between those organs and the poison of tubercular disease. And if this be so, I think we may carry it a little further, and suppose that the apex is first affected, because the affinity is here the strongest. I confess that all the physical explanations of this undoubted fact have been most unsatisfactory to my mind; Dr. Williams's idea that it depends upon the large quantity of interstitial areolar tissue, is perhaps the best; but it does not convince. I am more inclined to seek its rationale among the vitalities, than among the mere dead physics.

Now, we have many examples of the limited workings of the peculiar elective, or attractive force of which

we are speaking, and for which we can *see* no structural cause whatever. Doubtless, these material causes do exist; but they lie among the molecules, not the visible arrangements of parts: they are made sensible to us only by the manifested effects; we could not predicate them from the results of ocular inspection, even when our eyes are assisted by the best instruments, and are themselves trained to the most accurate observation. What is there, for instance, in the structure of the skin, of the arm we will say, to explain why one small portion should be occupied by scales of lepra, while the contiguous, and to all appearance precisely similar, portions remain altogether unaffected? Why does the poison specially choose out *symmetrical* parts, to the exclusion of others? We cannot tell by merely looking at them. We believe there must be differences between various portions of the same texture, but are compelled to confess that they are inappreciable.

But, though thus baffled in our desires to assign a palpable cause, there is no difficulty in the recognition of the fact itself; and it is one of exceeding great importance and interest, having a wide and extensive bearing, not only on the subject of disease, but on the great question of analogies of structure. On this, however, we cannot enter.[1]

Some of Mr. Blake's exceedingly valuable experiments give a singular illustration of these remarkable elective affinities, and show that they are not confined

[1] See, on this subject, Dr. W. Budd's most admirable paper, already referred to.

to the inter-workings of organic and vitalized substances alone. He found that, in their action upon the heart, the chlorine group of acids "increase and prolong, in a marked degree, the irritability of the *ventricles*, whilst they weaken that of the *auricles*. The ventricles will continue irritable, for ten or twenty minutes after mechanical stimuli have ceased to affect the auricles; and circulation will continue for many minutes after respiration has ceased, and even with more vigour than it ordinarily has during life. The pressure in the arterial system has been found equal to a column of mercury of seven inches, eight or ten minutes after respiration had ceased; and even when the pressure has sunk to two inches, it will again rise to five or six; the heart apparently receiving a fresh stimulus, although the animal had been seemingly dead for some minutes."[1]

If, then, two portions of the same muscular organ are thus variously affected by the same agent;—if, as we know, strychnia accumulates in, and thus exerts its powerful action on what Dr. M. Hall calls the *true spinal cord*, to the exclusion of all other parts of the medulla;—if the poison which gives rise to cutaneous eruptions, seizes upon one patch of skin, and leaves the rest;—have we not in these, and many others might be cited, warrant good for the explanation we are seeking to offer? Does not the very fact itself tend to add further confirmation to the doctrine of the poison-origin of phthisis?

[1] Brit. and For. Med.-Chir. Review, vol. ii, p. 185.

The greater frequency of tubercles in the *left* lung is probably explicable on the same principle, and it is illustrated by the analogous facts observed in regard to cancer, viz. that the *right* lung, and the *lower* lip are most commonly affected in that disease, and that there is a similar tendency in regard to the kidneys: in thirty-five cases, noted by Dr. Walshe, both organs were implicated sixteen times, the right alone thirteen times, and the left six.[1] Compare with this the results of Louis' observations.[2] In almost every case both lungs contained tubercles. In five instances, however, the morbid change was limited to the left lung, and in two only to the right.

There are one or two other general resemblances, to which I have not yet alluded, and which may find their appropriate place here.

All poisons, whether medicinal or morbid (excepting the corrosives), have their periods of latency; a certain time elapses between their introduction into the system, and the first development of constitutional or local symptoms. The length of this period is exceedingly variable. It may be so short as to be scarcely appreciable, as in respect of strong doses of hydrocyanic acid; or it may extend over many months, as in several recorded cases of hydrophobia. But in all there is a space, during which we have no external evidences of the presence of anything abnormal in the economy.

Precisely the same occurs with regard to phthisis

[1] See Brit. and For. Med. Review, vol. xxii, p. 304.

[2] Loc. cit., p. 6.

and scrofula. When the disease is hereditary, as in the great majority of instances, the morbid impression, whatever that may be, must have existed from birth. This is undeniable. But months or years may elapse before symptoms arise to indicate the lurking mischief; the individual appearing all that time to be in the enjoyment of perfect health.

Again, the rapidity with which a poison acts, and the violence of the symptoms produced, are greatly influenced by the state of the system at large; and it appears conclusively proved, that whatever depresses the vital energies, tends to exalt the efficacy of the poison. Thus, in Magendie's experiments it was shown that if a poison was introduced into the system of such potency as usually to destroy life in two minutes, on bleeding the animal the same result will follow in half a minute, or in one fourth of the time.[1] But this is not all; a poison may be present in the body, and remain there without producing any appreciable effects, until favorable circumstances call it into action. This is often illustrated in cases of ague. Dr. Watson[2] records a very interesting example, and one which affords a proof of both of the statements just made: "The late Dr. Jas. Gregory, of Edinburgh, had a brother-in-law, who illustrated well, in his own person, the effects of predisposing circumstances in respect to ague. This gentleman was a strong active man, and commanded a battalion in the West Indies; and he

[1] Williams, Morbid Poisons, vol. i, p. 8.

[2] Lectures, vol. i, p. 712, first edit.

escaped for a long time, while others were falling around him in remittent fever. At last he was wounded by a musket-ball, which passed through his shoulder. He insisted, much against the will of the surgeon of the regiment, on resuming his duties before his strength was completely restored; and the consequence was, that he was immediately attacked by remittent fever, of such violence, that his life was for some time despaired of. But this was not all. The remittent disease assumed by degrees a distinctly intermittent form, and became a tertian; and at last he got well and strong, and came over to this country. But for a long while, though to all appearance his health was reestablished, ague fits would, from time to time, occur, and they came precisely at the day and hour on which they would have happened, if the tertian had continued with its original type; and slight causes were sufficient to reproduce them."

Two cases have come under my own notice, of an equally remarkable character. The subjects of both had lived for years in the fenny counties, but had never been affected with ague. They both became consumptive; and while residing here, where we have no ague spontaneously generated, they both passed through regular attacks of intermittent; the debility consequent on the tubercular disease being evidently the exciting cause of this intercurrent malady.

The precise analogues of these facts are continually presented to our notice in phthisis. Witness the number of cases which may be traced back to an attack of in-

fluenza,[1] or which follow in the course of some of the exanthemata, or which seem to have originated in mental depression. For, though there is, perhaps, no proof that any of these can produce the disease of themselves, there is sufficient evidence to demonstrate that they are true exciting causes, when the predisposition already exists.

Once more. There is another general law, which regulates the operation of substances foreign to the animal economy, whether they have the nature of medicinal agents, or possess the character of morbid poisons, viz. that when they are attracted to any given point, this very fact is a reason why they should accumulate there, in greatly increased quantities; just as the introduction of a ready-formed crystal into a saline solution, invariably causes the rapid deposition of fresh particles around it. Digitalis affords a good example of the working of this rule, in the incompatibility of its sedative and diuretic actions; when once the active principle of the drug is determined to the kidneys, there is little fear of its force being expended on the heart. And the like is observed of mercury, which proves a valuable diuretic, when the right direction of its influence is secured by some other agent, such as squills. Many illustrations might be cited from the phenomena of various diseases, but I shall content

[1] An instance of the kind occurred to me this morning. A gentleman, who had enjoyed uniform good health, and lived an active life, much in the open air, was attacked last spring with the prevailing epidemic. Since that time he has had constant cough, and his lungs are now full of tubercles.

myself with one, familiar to every practitioner. It is a matter of universal experience, that the severe internal affections, which frequently occur in patients of the gouty diathesis, and resist all ordinary methods of treatment, will disappear immediately on the occurrence of a regular attack in a joint; the poison which had been hitherto floating about, now fixing upon one organ, now on another, being thus attracted to, and accumulating in, its proper seat; and the relief occurs, even when no means are employed to neutralize the poison, or to prevent its formation in the system.

Now, the same is observable of tubercle:—"Whatever determines the first deposition of tubercle in a tissue, will with greater facility effect its increase, by the addition of similar matter to a ready-formed nucleus."[1]

Before bringing this portion of our inquiry to a conclusion, I must, for a moment, allude to another fact, not strictly connected with the foregoing, but worthy of attention, as illustrating a very important truth in the history of phthisis, viz. that parts organically damaged, either by mechanical injury, or by antecedent inflammation, are specially liable to become the seat of tuberculous deposition. And for this purpose I cannot do better than quote a case narrated by Dr. W. Budd, in the paper so often referred to: "A sailor was admitted into the Dreadnought, on account of a bruise inflicted on one side of his breech, by a fall into the hold of a

[1] Williams, Lib. of Pract. Med., vol. iii, p. 169.

ship. In the course of some days he left the hospital, having recovered from the injury, but still showing a bruise mark on the breech. A short time after, he was again admitted with severe febrile symptoms, which terminated in the eruption of smallpox. The pustules were discrete, and very few in number, all over the body, except in the exact seat of the former bruise, and there they were extremely numerous, and for the most part confluent."[1] Here the altered condition of the tissues, consequent on the preceding injury, evidently served as a local attraction to the variolous poison. And the force exerted by the analogous change resulting from inflammation, is well shown in the disturbance of the symmetrical arrangement of atheromatous patches in arteries. I quote again from Dr. Budd: "Of the whole group of symmetrical diseases, this is one of the most remarkable for the exactness of the symmetry in which the lesions usually occur; a circumstance probably owing in part to the very chronic course of the affection, and to the exclusion from external disturbing influences, which the arterial tissue enjoys by reason of its deep seat. But now and then inflammation occurs in the lining membrane of the arteries, and the ulterior effect of this is, following in this the analogy of other diseases, to cause the atheromatous matter to be deposited in the former seat of inflammation, in preference to other parts; and as inflammation of the arteries does not generally follow the law of symmetry in its

[1] Loc. cit., p. 129.

development, the atheromatous deposits which ensue are not distributed in their usual symmetrical order."

I have very lately met with a striking example of this disarrangement of the ordinary localization of tubercle in the lungs, in the person of a patient, whose history proved that pneumonia was the origin of his phthisical disease. On examination after death, it was observed, among other things of interest, that the tubercular deposit was most extensive in some portions of the lower lobes. One of the most perfect specimens of tubercular infiltration I ever saw, was found at the base of the right lung, extending from the edge for a considerable distance upwards.

But it may perhaps be objected to all that has been advanced in this section, that the proof is defective, because this supposed poison of scrofula and phthisis has never been isolated, its characters have never been ascertained, its seat and origin are unknown, and there is no conclusive evidence that it can be communicated from one individual to another. Let us attend to these points for a little.

It is perfectly true that we have never yet succeeded, and very probably never will succeed, in the isolation of the poison; but this is no argument for its non-existence. There are few who, in this day, would be bold enough to deny that intermittent fevers, or typhus, or plague originate each in a peculiar poison of its own, though no chemist has either separated or analysed it, and no microscopist has seen it on the field of his instrument.

The *laws* of these diseases form the basis of our reasoning, and those laws, as we have shown, are applicable to phthisis.

There is no possible question as to the poison-origin of syphilis, or gonorrhœa, or smallpox; and yet the *characters* of these poisons are altogether unknown, for the purulent matters in which they reside have no distinctive appearances; there is nothing in their appreciable qualities to tell us why the one should produce a chancre, and the other severe fever with a crop of cutaneous pustules. The lymph taken from a cowpox vesicle has nothing in it, so far as we are informed, by which we could separate it from the similar clear fluid of herpes; and yet the former can set up an action in the entire system, which will antagonise, and, in great measure destroy, the future influence of variolous matter, while the latter is absolutely inoperative.

Hydrophobia may be developed spontaneously, or rather from the operation of causes concerning which we are perfectly ignorant; but is this any reason why we should deny that its fearful phenomena depend upon a true poison? Shall we doubt the nature of the effects which follow the bite of the rattlesnake, because we cannot tell why the cells of the poison-bag should elaborate a matter so deadly from the blood, which is itself innocuous? Or can we shut our eyes to the fact, that there is a real *materies morbi* of epidemic cholera, because the circumstances under which it is primarily produced have not, as yet, received a clear elucidation?

The objection urged on the score of the non-contagious or infectious nature of phthisis, may be answered in the same way. Intermittents are not contagious; rheumatism is not caught by infection; nor can the poison of lepra, or of cancer, be propagated by inoculation; and yet all these are demonstrably poison-diseases. Mr. Phillips insists much on this deficiency, and almost ridicules the idea of the existence of a morbid poison in scrofula; but it is quite clear that his attention has been confined to a limited section of the great class—to those which are, strictly speaking, *virulent* diseases. Phthisis is, assuredly, not one of these; but that fact will not set aside deductions drawn from more extended views. Nor is it quite philosophical, in a question of this nature, to restrict our investigations within such narrow limits. If all morbid poisons, without exception, were communicable by contact, or by inoculation, the case would be different; as it at present stands, the absence of these qualities in the disease before us, forms no valid objection.

SECTION IV.

DIAGNOSIS.

The detection of tubercular disease of the lung is in some cases abundantly easy, but in others it presents one of the most difficult tasks a physician can encounter; while, at the same time, accuracy is of infinite importance. It is no light thing to condemn a man undeservedly as the subject of a disease so formidable; it is even a more serious error to overlook its existence when really present, and be thus led to speak lightly, and act carelessly, where serious consideration and extreme cautiousness are matters of vital moment. And yet this is continually done, and precautions, which might have proved saving, are neglected till the time for their successful employment has definitively passed away.

There are two separate sources from which our means of diagnosis are derived: the general symptoms and the physical signs. In some cases the one, in some the other, give us most assistance; but in none can either be overlooked with safety. It is perfectly true, as Dr. Forbes remarks,[1] that "a single blow on the clavicle will often afford the means of a more certain diagnosis and prognosis than weeks or even months

[1] Trans. of Laennec, Third edit., p. 340, note.

of observation of the general symptoms." But it is no less true, that we occasionally meet with cases in which neither auscultation nor percussion communicate any intelligible information; in which the disease at a certain stage is absolutely latent, so far as our senses of hearing are concerned, and in which a knowledge of our patient's real condition can be arrived at by a mental process only.

It is not my purpose, in this place, to enter into a minute and systematic description of the physical signs of phthisis, for this has been already most excellently done in works with which we are all familiar. I shall confine myself chiefly to a consideration of the means by which we may most satisfactorily arrive at just conclusions on any given case that is brought before us.

The addition of tubercular matter to the natural tissues of the lung, involves, as a necessary consequence, an increase of density, a diminution of the true, spongy, permeable structure. There is more solid matter in the organ, and consequently less air; and from this it follows that the healthy sounds of respiration, and those produced artificially by percussion must be more or less altered.

But in those cases where the tubercles are small, comparatively few in number, and scattered over a tolerable extent of lung, these differences, though they must exist, are scarcely, if at all, appreciable;[1] the

[1] Some ears, indeed, are so fine that they appear capable of detecting anything. A few years ago I examined an individual, in one of whose lungs *a single tubercle, the size of a pea*, had been said to exist; but, my

changes are too minute, and too completely masked by the prevailing healthy sounds, to make any impression on our sense of hearing. Now, in these cases, a recognition of the facts adduced in the last section will afford us assistance the most valuable. We cannot discover any marked or decided evidence of disease in the lungs, and if we restrict our attention to them we fail in our attempts to reach a clear opinion. But if we carefully investigate the general condition of our patient, we see at once that there is some lurking evil. Functions essential to the preservation of health are imperfectly performed; there is defective assimilation and insufficient nutrition; the flesh appears slowly wasting away; the energies flag, and the whole frame is enfeebled. The secretions and excretions are more or less decidedly removed from the healthy standard, either in respect of qualities or quantities; and, very generally, there is some measure of irregular febrile movement. Now, all these, as we have seen, indicate the presence of a morbid poison in the system, which produces widespread, though it may be slight, effects, because it is carried everywhere with the circulating fluids. And if in our investigations we fail to discover any other local mischief, sufficiently severe to account for the constitutional disturbance, we may safely conclude that the cough, which we ascertain to exist, though perhaps

own auscultating powers not being of so high an order, I was unable to find the lurking place of this solitary invader. Should any gentleman, as happily endowed as the discoverer of this tubercle, chance to read my pages, he may pass over the present paragraph as inapplicable to himself. I am only writing for ordinary mortals.

it has been so trivial as to be scarcely acknowledged, is, in truth, an index of pulmonary tubercle. Our patient is consumptive, and we at once put in operation that plan of treatment which his hazardous position demands.

Happily for ourselves,—and happily, too, for the sufferer, because the danger of non-recognition of his malady is thereby diminished,—this is not the usual course of events. Far more commonly, the tubercles, though they be few in number, are not thus sparsely scattered; they congregate in clusters, and thus reveal their presence; and, as is well known, they specially affect the apices of the lungs, and thus more plainly still betray their whereabouts. What then are the signs of this, the more ordinary form of incipient phthisis? They are derived from several sources.

In many instances, careful *inspection* of the chest will give some indications of the internal disease. It appears, from a statement by Dr. Walshe,[1] that Dr. Chambers has observed an enlargement in the antero-posterior diameter of the summit of the chest, in the early stages of some cases of phthisis; I have never, as yet, recognised this sign myself, but the well-known accuracy of that experienced physician, and a consideration of the pathological condition of the part at that period, incline me to believe that it might be noticed more frequently if these incipient cases were more carefully examined. But, in all probability, the

[1] Physical Diagnosis of Diseases of the Lungs, p. 167.

time during which the necessary conditions of such phenomenon exist is not of long duration, for, as we have seen in a former part of this work, tubercle, like other productions of low organization, has an inherent tendency to contract, and when this force has been brought into operation, the very converse of the above takes place, and we have local depression instead of prominence. And this sign is still more palpable when the irritation of the tubercles has given rise, as it so often does, to pleuritic effusion of plastic lymph, which is itself endowed with the same contractile tendency.

Coetaneously with, and consequent upon, this state of things, we have another evidence of embarrassment of the organ, in the diminished freedom and extent of motion of the corresponding thoracic parietes. All authorities are not agreed as to the reality of this sign; I have certainly observed it frequently, but have no notes of the ratio between the two sides in this respect. In M. Fournet's experience it was detected most commonly on the right side.

The indications derived from *percussion* are of the same character, and dependent on the like physical causes. The sound is diminished in clearness, and of shorter duration, and there is a sensation of resistance to the stroke, over the apex of the lung, both in front and behind. And this gradually passes into complete dullness, as the consolidation becomes more perfectly uniform. When the tubercles are not very numerous, and not closely aggregated, there is often much difficulty in arriving at a satisfactory conclusion, and it is

necessary to make the investigation under varying circumstances. Thus, during ordinary respiration, there may be no appreciable difference between the two sides of the chest; but if the patient take a full breath, the presence of the solid tubercle will be revealed by the greater increase of clearness in the sound lung; or, if he expire forcibly, by the proportionally greater dullness of the affected organ.

But here there are some sources of fallacy, which it is needful to bear in mind. The stroke-sound is duller over the right than the left pectoralis muscle of those who labour hard with the right arm; and, as stated by the reviewer[1] of Dr. Blakiston, "in a certain proportion of instances, where the parietes of the chest are perfectly identical on both sides, and where (as post-mortem examination proves) both lungs are perfectly free, both from consolidation changes and from rarefaction changes, the right apex-regions give out a harder and a less clear note than the left." The cause of this difference does not appear; but the fact, if clearly made out, is one of no small importance.

The presence of emphysema may also lead to error, if the examination be not carefully conducted in all its parts; and the same is true with regard to the effects of old-standing pleurisy, which may cause contraction of the chest, and dullness of the stroke-sound, independently of the existence of tubercles. These difficulties will be cleared up by the results of auscultation;

[1] Brit. and For. Med.-Chir. Review, vol. ii, p. 202.

for, if emphysema be present, the breath-sound will be weak in the sonorous portions; and if the dullness be caused by pleuritic deposition, the feebleness of the respiratory murmur will be uniform, or nearly so, which it is not when dependent upon masses of tubercle. We pass on, therefore, to the evidence derived from the sounds produced by the entrance and the exit of the air.

This evidence consists in alterations of the intensity, the character, and the rhythm of the respiratory murmurs, and in modifications of the vocal resonance, and the propagation of the cardiac and arterial sounds.

In the apex-regions of lungs occupied by tubercular deposits, the respiratory murmurs are usually at first weak, or almost suppressed in some points, while in others they are exaggerated, and of a harsh character. This I conceive to be a very important sign, and one far more valuable than mere feebleness of the breath-sound, which is natural in some cases, and which may be caused by other morbid states than tubercle. But then it must be a persistent phenomenon, to prove diagnostic, and we must have the evidence afforded by percussion that there is no emphysema. In other cases, instead of being weak, the respiration is harsh, and has somewhat of a blowing, bronchial character. This indication is most trustworthy when it exists on the left side, for in some subjects the breath-sound is naturally less soft, and more bronchial under the right clavicle, probably from the mechanical condition of the part, as regards the size and the course of the air-tubes.

Again, the rhythm of the murmurs is often *jerking*. I have observed this frequently, and am inclined to attach considerable weight to it, provided it exist in one lung, to the exclusion of the other, and still more, if it be limited to a part or parts of that lung. I have often heard it in nervous patients, where there was no disease, but then it was caused by the irregular spasmodic way in which they performed the respiratory act, and was, of course, general, and disappeared when the attention was directed to other things, or when custom enabled them to breathe more quietly. Still, even when quite local, the sign is not absolutely diagnostic; it may raise strong suspicions, but will not, alone, prove the existence of tubercles; for it may depend upon other and very different causes.

The sound of expiration is also frequently prolonged, and of a harsh character. My experience entirely coincides with that of Dr. Walshe, as to the uniformity of the alteration of special character when the duration of this murmur is increased, so far as to be decidedly appreciable; and I fully agree with him in the belief that its importance as diagnostic of the existence of tubercles has been greatly exaggerated. I have often heard it, and in a marked degree, when there was no other evidence whatever of the presence of such deposit, and where indeed it could be confidently affirmed that such did not exist. Moreover, it is abundantly evident that anything which obstructs the passage of the air outwards may give rise to this sign, and tubercle is only one of many causes that will act in that way. Never-

theless, its presence affords strong corroborative testimony, and therefore should be always carefully noted.

But besides these, which are mere modifications of the ordinary natural sounds, we have, after a time, and sometimes at an early period, the addition of the *dry crackling rhonchus*, which gradually, as the disease advances, passes into the humid form. The first, so far as I am aware, exists only in phthisis, and when the tubercles are unsoftened, and in moderate quantity; it is essential, therefore, to know and be able to recognise it. I quote Dr. Walshe's description, which is particularly clear and distinct: "The dry crackling rhonchus is composed of a succession of minute, dry, short, sharp, crackling sounds, few in number, rarely exceeding three or four in a respiration; coexisting exclusively, or almost exclusively, with inspiration; persistent, in the great majority of cases, after its characters have once been fully developed, until it ceases altogether to be produced, in consequence of its passing into the humid crackling rhonchus; and usually conveying the impression to the ear of being evolved at a distance from the surface." Its mechanism has not yet been ascertained.

The *humid crackling*, again, is "a rhonchus composed of a series of crepitations, having a clicking character; few in number; of moderate size; occurring during both respiratory movements, but with greater regularity and distinctness of character in inspiration; and eventually passing into, or rather superseded by, the mucous species." It is indicative of the softening of tubercles. Both have this feature in common, that they are not

altered by coughing; and by this, as well as their more special characteristics, they are distinguished from the mucous râles.

Their presence constitutes a sign of the most ominous nature. In several cases, where the other indications were indistinct, the sharp, threatening *click* just described has made the matter only too plain; and often, when all things appeared to be going on most favorably, and there were good expectations that the affected lung would remain quiescent (which, when disease exists to any amount, is perhaps all that we can rationally anticipate), have I had my hopes dashed by the development of those crepitations, which betrayed the softenings of the morbid deposit, and at once opened up the prospect of ulcerating caverns, and all the attendant train of evils.

But, besides the two rhonchi above noticed, we may have, at any time, the *true subcrepitant rhonchus* produced by the occurrence of capillary bronchitis. This *râle* is not in itself characteristic of tubercular disease; but when it is limited, as regards its localization, to the apex of one or both lungs, in the vast majority of instances the patient is phthisical; the inflammatory condition being either caused by the direct irritation of the tubercles themselves, or being determined to that position, when the exciting cause has been external, by virtue of the general law that the previously affected portions of an organ are the first to suffer. Its presence, therefore, is a diagnostic sign of considerable value.

The indications derived from the *resonance of the voice* appear to me less trustworthy, in the early stages of phthisis, and are certainly of more limited application, seeing that the natural variations are great, and that in most, if not in all cases, there is more vocal resonance over the apex of the right than of the left lung. The same may be said of the extent to which the cardiac sounds are propagated, for in this respect also individual differences are considerable. When, however, they are heard with more distinctness and clearness at any given point more distant from the centre of the circulation, than at another more near, we have in this fact good grounds for concluding, that there is some change in the condition either of the lung or pleura at one of these points; there must be condensation at the point where the sounds are loud, or rarefaction where they are weak. And in this way we may derive substantial corroborative testimony. I remember, on one occasion, hearing both heart-sounds with remarkable distinctness at the lateral and inferior aspect of the right lung, while they were comparatively faint above, and in front. The case was one in which there had been partial pleuro-pneumonia, leading to consolidation and effusion on the pleural surface.

I have occasionally noticed the subclavian murmur described by Dr. Stokes, but entertain doubts as to its value as a diagnostic mark of phthisis; for it has certainly been present where there were no other indications of tubercular disease, and where the progress

of the cases gave fair grounds for believing that such did not exist.

Is there then any physical sign, which, taken singly, can be regarded as universally decisive of the commencement of tubercular consumption?

This question, I conceive, must be answered in the negative; for there is none so uniformly present, as to fulfil the necessary conditions of such indication. The crackling rhonchi, and the irregular respiration, weak in some points, and loud or harsh in others, appear to me the most trustworthy; and when they coexist with some measure of comparative dullness of the stroke-sound, and with a certain amount of general symptoms, the diagnosis may be usually made with some confidence.[1]

I would here again direct attention to the extreme importance of a correct appreciation of the *nature* of the constitutional symptoms, their extent, and their order of appearance; for I am persuaded that fewer mistakes would arise, if these were more carefully investigated. Some of the physical signs, most commonly set down as declarative of the presence of tubercles, may depend upon other and very different causes; but those causes, which are usually local in their action, do not produce the same wide-spread general effects. They influence the part, but not the

[1] In examining patients affected with pulmonary disease, many physicians neglect auscultation of the *post-clavicular regions*, and yet it is here that the most satisfactory indications are very often found. I have frequently experienced the benefit of careful investigation of this part, since my attention was first directed to it by Dr. Williams.

system. And a remembrance of this fact will greatly tend to clear up and disperse difficulties.

As the disease advances, and the disorganization of the lung becomes more extensive, the diagnosis also is usually more easy. The flattening of the apex-regions is increased, and the diminution of the costal movements more decided. The stroke-sound becomes completely dull, and has commonly the wooden special character. There is strong, concentrated bronchophony, passing at length into pectoriloquy. The cough is bronchial or cavernous; and we have abundant humid râles, varying in their character, according to their particular seat, from the subcrepitant to the coarse gargouillement of the ulcerated excavations; or the respiration is blowing, or tubular, or amphoric. On these signs it is not my purpose to delay; they are well known, and can scarcely be misinterpreted, if due precautions be adopted, and the totality of the symptoms carefully investigated.

Perhaps the nearest resemblance to the physical signs of advanced phthisis, is found in cases of chronic bronchitis, with dilated bronchi. For here, in certain portions of the chest, we may have cavernous breathing, and cough, and rhonchus, and more or less marked pectoriloquy, while the sputa are of a purulent nature. In a case now under my care, all these signs existed a few weeks ago. The patient, an elderly gentleman, was recovering from a severe attack of bronchitis. At the inner end of the left supra-spinous region, there was the most decided circumscribed blowing respiration,

with concentrated bronchophony, nearly approaching to pectoriloquy ; in the neighbouring parts the respiration was harsh, with prolonged expiration. Below the scapula, and towards the median line, there were similar, but less marked, cavernous sounds, and frequently gargouillement. And the sputa were muco-purulent. But there was no evidence of cavities in front. Percussion was clear in the subclavicular regions ; and the history, and general symptoms, and age of the patient, forbade the supposition of tubercular disease.

It is thus that the diagnosis may be usually made, viz., from the situation of the cavities, which are commonly found as in the case above, and not in the ordinary localities of phthisical excavations ; from their considerable extent, which however remains persistent, and does not tend to spread ; from the condition of the pulmonary texture around, which, excepting in certain cases to be mentioned immediately, is generally more resonant on percussion ; and, above all, from the course of the disease, and the nature and amount of the constitutional symptoms.

The exceptional cases to which I have just alluded, are those in which the dilatation of the bronchi has originated in pleuro-pneumonia, an occurrence which the researches of MM. Rilliet and Barthez have shown to be not uncommon in young subjects.[1] But in these instances the dullness will be found more complete than in phthisis, and accompanied with more contraction of the chest.

Nevertheless, with all these aids, we may be de-

[1] Vide Walshe, loc. cit., p. 271.

ceived, as is demonstrated by a most instructive case narrated by Louis.[1] The patient had been short-breathed from infancy, and, at the time of admission, had suffered from cough for ten years. He was emaciated, had lost appetite and strength, had some œdema of the legs, diarrhœa, and night sweats. The respiration was almost perfectly tracheal; there was large-sized crepitant rhonchus under the right clavicle, and posteriorly, on the same side, in the corresponding region; marked resonance of the voice, and imperfect pectoriloquy in the same places. But the chest was sonorous throughout, and he had never had hæmoptysis, nor pain of chest: these being the only circumstances which tended to throw doubt on the diagnosis. Louis believed him to be the subject of phthisis. On examination after death, a portion of the apex of the right lung appeared transformed into a great number of cysts, varying in size between that of a pea and of a large filbert. They were merely dilated bronchi, and there were neither tubercles nor tuberculous matter anywhere. Such a case, however, is exceedingly rare.

If ulceration of the larynx, or tubercular peritonitis be present, the diagnosis will be made clear, even in cases which would otherwise have been involved in great doubt. And at all times the occurrence of hæmoptysis should lead to strong suspicion; for, of all *symptoms*, this is the one which, taken singly, has most value.

Thus much for the diagnosis of the more ordinary forms of phthisis. How are we to distinguish between

[1] Louis, loc. cit., p. 466.

the *acute* variety of the disease, and the pneumonia or bronchitis which it so closely simulates? I believe that, in many cases, the constitutional history of the patient, and the effects, or rather the non-effects, of remedies, afford us the only available means. Indeed, if the view I have taken of one form of acute phthisis, viz., the pneumonic, be correct, it necessarily follows that the symptoms and the physical signs must be, in a great measure, identical; for inflammation of the substance of the lung is the pathological condition in both, the different results being caused by the presence or absence of the peculiar morbid poison. And the great general excitement of the system, under these circumstances, materially interferes with our recognition of the operations of such agent. Effects which, in the chronic or more quietly progressing affection, might be rationally attributed to its influence, are obscured, in respect of their interpretation, in the cases we are now considering, by the known alterations of the blood in severe inflammations, and the extensive disturbance of functions, and embarrassment of organs, which are thus produced. So that one great help is almost taken away.

Nor shall we find much trustworthy assistance in the localization of the morbid changes, for, though much has been said and written regarding the infrequency of pneumonic consolidations at the upper part of the lungs, it has been clearly proved by the extensive researches of Grisolle, that such an event is by no means uncommon. In 264 cases, there was pneumonia of the upper lobe in 101, of the lower in 133, and of the middle part in 30.[1]

[1] Walshe, loc. cit., p. 243.

And though the preponderance is still in favour of the base of the organs, the exceptions are more than sufficiently numerous to destroy the value of the supposed election as a diagnostic sign.

In the other form, in which miliary tubercles are deposited in great numbers, and with great rapidity, the symptoms and the signs are usually those of capillary bronchitis. And here we meet with somewhat less difficulties. For we know that idiopathic bronchitis is most commonly situated in the lower and middle parts of the chest, while that which accompanies the formation of tubercles extends generally to the upper lobes, and may commence, and be limited for a time to that region, spreading from above downwards, rather than from below upwards. The sound on percussion is also, perhaps, duller, and increasingly so; but this, or, at least, its appreciableness, is denied by some observers of eminence, as Dr. Blakiston.[1] If the tubercles congregate in masses, there will be irregularity of the respiratory sounds. And in all cases, the symptoms have more of a hectic character: there is more tendency to night-sweats; the pulse is unusually frequent; the disease does not go through the regular stages of the common affection, increasing up to a certain point, and then declining, with coincident changes of the expectoration, but is continuous in its severity; and, above all, remedies which ordinarily exert a beneficial influence over the simple disease, prove of slighter efficacy, or, too often, are absolutely inoperative.

[1] Practical Observations on certain Diseases of the Chest, p. 336.

SECTION V.

TREATMENT.

Our former investigations concerning the true nature of phthisis will prove, I conceive, of signal service in communicating clearness and precision to our views regarding its right treatment. For having once arrived at a definite conclusion, as to the essential cause of the phenomena, we know in what direction to work, and acquire an intelligent perception of the end at which we should aim. So long as our ideas of the intimate nature of any disease are uncertain, so long will our practice, of necessity, be fluctuating and inconsistent. Swayed hither and thither by conflicting opinions, we try now one plan, now another, to our own great discomfort, and our patient's little ease. And if, by chance, we hit upon a right method, we too often do not recognise the reason of our success, and are therefore unable to apply it satisfactorily to other cases in which special peculiarities require specific modifications of the same general agents.

The truth of this is well illustrated by the simplicity of the approved treatment of fever now, as compared with that which obtained some years ago; a result evidently dependent upon our more correct appreciation of the nature of the disease. While the controversy

was still stoutly waged between those who maintained that fever was essentially inflammation of the brain, and those who held it to be inflammation and ulceration of the intestinal glandulæ, it was impossible to have fixed views of the treatment, and there were strong temptations to meddlesome interference. We know now that the symptoms result from the poisoned condition of the blood; we have learned that they cannot be overcome by heroic remedies, simply because those remedies are unable to remove the cause; and, accordingly, our efforts are limited to the affording assistance to Nature in her own work of eliminating the poison; —stimulating when the natural powers are deficient— controlling when they are excessive, and guiding when they appear to be misdirected in their actions.

The history of phthisis presents us with a picture precisely analogous. Treatments the most opposite and contradictory have been advocated and applied by men of no mean note; the rigid antiphlogistic method of one, standing in marked contrast to the tonics and the generous diet of another. But this is now much altered; the progress of investigation has already cleared up many doubts, and we find that the views of our leading authorities are, on the whole, in striking accordance. I shall, in the present section, endeavour to trace out the rationale of this plan, and to show *why* it is that experience has proved it to be the best.

We have seen, in our preceding inquiries, that tubercle is the resultant of a peculiar form of abnormal nutrition, and have found reason to believe that the

cause of this abnormal nutrition is to be discovered in the presence of a morbid poison in the blood. Reasoning on these two propositions, we are naturally led to the conclusion, that the treatment of tubercular diseases, to be effectual, must be directed to the securing of the following ends :—viz., the neutralization of the poison, or its elimination from the system, and the restoration to a healthy state of the great function of nutrition in all its parts. Combined with these there must be, of course, the meeting of local evils, by local remedies; including under that term, not only such means as act directly on the part to which they are applied, but also those agents which, though they may have a general influence, in some measure, on the system at large, have likewise, in addition to this, a special action upon particular organs.

Now, it is abundantly evident that the simplest and most satisfactory way of curing our tubercular patients, would be that first named,—the neutralization of the poison; because, by doing this, we should at once and definitively remove the cause of their disease. But, unfortunately, there are difficulties in the way, which are well-nigh insuperable. We do not know the nature of the poison, and we have not found its antidote; for it is quite clear, that the alleged specifics, from time to time proposed with so much confidence, are no specifics at all. Still, I think the search for such a remedy should not be abandoned, for the boon would be inestimable; but then it must be conducted wisely, and by those who are well acquainted with the

natural history of the disease with which they are contending, and who know what in its phenomena is essential, and what merely accidental. *A solvent for tubercle is not the thing required.* What we need is something which will go far deeper, and remove that on which the deposit originally depends.

This, however, being as yet unattained, we are shut up to the other plan, and must labour to promote the elimination of the poison from the system, and to restore the general health. I proceed to consider how far these objects are secured by the means most usually employed in the treatment of phthisis.

But before entering fully upon the subject, it will be necessary to attend shortly to the question of treatment, as it respects the acute forms of the disease; because, though the same general principles should be still kept in view, the rapidity with which the disease advances, and the state of morbid activity in the organs, render special modifications imperatively requisite. We have no time for slow operations; a decided check must be put on the disease at once, or the patient will infallibly die.

I have already stated it as my belief, that the pathological condition in acute phthisis is a true inflammation, modified in its characteristics, and in its organic results by the constitutional condition of the subject, but in its fundamental nature essentially the same as ordinary pneumonia or bronchitis. If this be so, then it is clear the treatment must also be analogous. We must act upon strictly antiphlogistic

principles. But in doing this, we are encompassed by many difficulties. Heroic activity may bring about the very evils we dread, by irretrievably crushing the vital energies; too great timidity may leave the morbid processes to run their course, unchecked and fatally. It is evident the inflammation must be subdued; but it is equally evident that the safety of our patient depends upon our not depressing him more than is absolutely necessary. I should, therefore, be very cautious in the employment of general bloodletting, opening a vein only when such a measure appeared altogether unavoidable, (which is very rarely the case,) and by no means carrying the evacuation to such lengths, as might be warrantable in other subjects. Indeed, experience has shown that severe thoracic inflammations, in their ordinary form, may often be cured without venesection, as readily as with; and this is an additional, and by no means trivial reason why we should abstain from such a step, except upon extreme compulsion. In my own practice, local depletion, blisters, and antimony, or mercury, as occasion might demand, have been the means most generally employed, and with most satisfaction. There are dangers in the use of mercury, so as to affect the system, in scrofulous subjects, and I should hesitate to employ it, in the way recommended by Dr. Stokes, in the incipient stages of ordinary phthisis; but the instances we are now considering are of a different kind, and the injury that would be produced by the extension or continuance of the morbid action is

infinitely greater and more certain, than the possible mischief that might accrue from the exhibition of that mineral, and I have, therefore, never hesitated to employ it, when it appeared to be indicated by the symptoms. With these means it is well to combine the use of salines, especially the nitrate of potash, which has the property of rendering the fibrin of the blood soluble, and thus may promote the absorption of the effused lymph. I shall speak more fully presently of the action of saline medicines generally, and point out the advantages which are derived from their employment.

Dr. Blakiston[1] relates a very interesting case of acute phthisis, of the pneumonic type, treated successfully by mercury administered through the skin, the strong mercurial ointment with camphor and opium being rubbed on the chest every four hours. This plan may be advantageously substituted for the more ordinary method, in many cases, especially where the mucous membranes are very irritable, as is not uncommon in scrofulous subjects.

The same judicious physician also recommends that quinine or ammonia should be given at the same time that antimony is administered, for the cure of pneumonic attacks occurring in advanced stages of the disease. And, indeed, in all cases, so soon as the symptoms admit, recourse should be had to remedies of the tonic class, for the debility inevitably consequent

[1] Loc. cit., p. 352.

upon the acute affection formidably increases the danger of chronic tubercular deposits.

In the more ordinary and slower progress of phthisis, to which I shall now direct attention, we have time for the full carrying out of that course of treatment, which is indicated by the nature of the malady; and in considering it, we shall perceive more clearly how its various parts are in accordance with the views I have been engaged in advocating. And in this we shall, I think, obtain additional confirmatory evidence of their accuracy. For, as is well known, the effects of remedies will often decide the question of the true nature of a disease, more satisfactorily than any other means or arguments. To quote only one instance: Periostitis may be the result of syphilis, or it may arise from other causes. In the former case it is readily curable by the iodide of potassium, while the same medicine has little or no influence when the inflammation is devoid of that specific character. In a doubtful case, therefore, the action of the remedy will go far to clear up matters.

What, then, are the general principles which guide our treatment, in those diseases which are universally recognised as depending upon the presence of a morbid poison in the circulating fluids? They are shortly these:—to secure the removal of the poison by the natural channels of outlet,—to moderate the fever which it always produces to a greater or less extent,—to check undue local excitements which are very

apt to occur during the process of elimination,—and to support the system at large, so that it may be able to bear the constant demands made upon it. I have omitted in this enumeration, the exhibition of specifics, —such as quinine in ague,—because, as we have already seen, we are not yet in possession of any such remedy for phthisis; precisely as we are helpless, in this way, in regard to typhus, or cholera, or smallpox, and many others.

To this line of treatment we have been gradually led, not only by the experience derived from the trial of various conflicting methods, but also by the more correct knowledge we have obtained of the natural history of diseases, and by the observation of the methods adopted by Nature herself to get rid of noxious matters introduced from without, whether designedly for the very purpose alluded to, as in experiments,—or in ordinary cases of poisoning,—and the medicinal administration of active remedies.

Now, the channels by which these substances are carried out of the system, are, mainly, the great blood-depurating organs, the skin,—the lungs,—the intestinal mucous membrane, with its appended glands, especially the liver and the kidneys.

I may here observe, in passing, that it appears probable that the special action of particular medicines on particular organs, will receive its most correct explanation in the above fact. The substance, whatever it may be, is absorbed from the surface to which it is originally applied; it enters the torrent of the

circulation, and having a special affinity for some particular organ or texture, is carried there, or there arrested in its progress, and while being thus appropriated, or selected for the purpose of elimination, it modifies the nutrition of the part, and thus produces the effects we witness. In this way, I conceive, we may explain many things which are otherwise not easily intelligible; as, for example, the action of chlorate of potash. I have, in a multitude of instances, convinced myself that a commencing catarrh may very often be permanently arrested by a full dose, as a scruple of this salt: but, for a long time, I was in great doubt as to how the manifest result was brought about. Recently, however, I have observed, that when I took the above dose at night, its peculiar taste was strongly perceptible in the mouth next morning, it became increasingly so during the day, and was most disagreeably marked in the evening; and I also noticed that when, from any cause, there was an increased flow of saliva, the flavour was immediately much heightened, clearly showing that it was passing out of the blood with that fluid secretion. Does not this fact reveal the rationale of its action? Is it not during this process of elimination, that it subdues the local irritation which constitutes the first stage of an ordinary catarrh? And is it not in the same way that it exerts so peculiarly beneficial an influence in cancrum oris, and some other unhealthy ulcerations of the mouth or fauces?

It may, perhaps, be objected that, if this be the

modus operandi of these remedies, the same effects ought to follow from their local application to the parts affected. But there is really no force in such an argument. It is one thing to apply a medicinal agent directly to an inflamed surface, and quite another to have it mixed with the blood-plasma of the part. In the first, it can merely exert an influence on the nerves and capillary vessels with which it is brought in contact, unless that contact be maintained long enough to allow of its absorption; in the other it is present in the vessels themselves, and may thus, in like manner, modify their action: but it is also, beyond and above this, commingled with the fluid blastema, from which the tissues and secretions of the organ are directly formed, and is thus in the most favorable position for producing a change in these results. In the one, it merely touches the outskirts; in the other, it is introduced into the very centre of the operations. And, moreover, the very fact of its forming for the time an ingredient of the circulating fluids, and being thus exposed to the chemico-vital actions of the organic laboratory, may have a great, though perhaps not explicable influence upon its own peculiar endowments. But to return.

This elimination, of which we have been speaking, is not a new process, set up for the occasion in the economy, but merely an adjunct to the ordinary operations of secretion and excretion; and for its right performance, it is, of course, essential that the organs should be in a healthy, active condition. Hence the

importance of attending to the state of the skin, the liver, and the kidneys, in all cases of threatened or actually developed tubercular disease. There is undoubtedly another grand reason for the same care, viz. the necessity of maintaining a due purification of the blood (irrespective of any special poison-matter that may be in it), without which, in no case can the general health be secured. But the object I have just stated, though not so universally recognised, is quite as actual and substantial a requirement. And I conceive that much good will be done by keeping this steadily in view; for it is not always easy to persuade our patients of the vital importance of attending to the hygyenic rules by which such desirable results are secured; and it is well to have more than one argument whereby to enforce our orders, and more than one reason to impress their value on *our own minds*.

My experience entirely accords with that of the best observers, in regard to the great benefit derivable from full and frequent ablutions of the entire surface, and more especially of the chest, not only as a preventive of disease, but also as an auxiliary curative measure when phthisis has commenced, or is established. And for this reason I strongly object to the covering of the surface of the thorax with plasters, a plan to which some practitioners are greatly attached. If the object be to stimulate or to soothe, both these can be equally well effected by other means, which leave the skin free and comfortably perspirable, instead of blocking up so many outlets,

through which the blood might be freed from some portion of the offending matters. If the desire be to obtain protection from cold, it is abundantly evident that we are not restricted to so clumsy and unpleasant a contrivance. Good flannel, or, if need be, a chamois-leather jacket in addition, will keep a patient warmer, and that in a more natural and healthy way than all the plasters that ever were compounded.

Beside, I have frequently observed that, in phthisical subjects, there is an excessive secretion of sebaceous matter, rendering the skin most disagreeably greasy. It is clear that if this condition be not remedied, free transpiration cannot take place, and consequently the blood cannot be properly purified; and here we have another argument in favour of the liberal use of water.

I believe that much of the known good of bathing results from this surface-cleansing, and not merely from the general tone thus imparted to the vital powers. And the effect is heightened by the addition of active frictions, by which a large amount of useless, worn-out epidermis is removed, the perspiratory tubes are left more free, and the whole cutaneous texture is stimulated to more vigorous action.

How effectually morbid poisons may, occasionally, be drained out of the system by the skin, we see exemplified in the cure of some gouty and rheumatic cases, under hydropathic treatment. But here it appears necessary to enter a *caveat*. I have more than once seen death produced by the rigorous adoption of that method in phthisical subjects. Their vital

energies are too low to bear up against the excessive evacuations; there is not power in the circulation sufficient to establish healthy reaction; and, as a necessary consequence, the internal organs become gorged with blood, and the morbid process, which it was intended to subdue, is roused to fatal activity.

About two years ago I was requested, late in the evening, to visit a gentleman, who was represented as being very ill. I found a young man propped up in bed, and suffering from intense dyspnœa. He had the face of a dying man; the lips were blue; the pulse scarcely perceptible. He could barely articulate, and was harassed with incessant cough, every now and then expectorating, with great difficulty, a small quantity of tenacious bloody mucus. On auscultating his chest, as well as circumstances would admit, I found extensive dullness, on percussion, on both sides, and not a trace of true vesicular breathing. He informed me that he had been consumptive for several years, that he was a *water-cure* patient, and that the effects of that treatment were wonderful. He had taken one or two (I think the latter) cold baths that day, and was persuaded that if he could be placed in a regular hydropathic establishment, he would be speedily well. He died during the night.

Here, very evidently, the external cold had augmented, if it did not produce, the pneumonia which destroyed him; and in this case we have a striking illustration of the mischief of the excessive and injudicious employment of means, which in themselves are

good, and which, rightly and moderately used, may be productive of much benefit.

It is but justice to observe, that, in the above case, the treatment was adopted by the patient himself, not under advice; and that a letter from his hydropathic doctor, which arrived after his death, contained a recommendation to put himself into the hands of an ordinary practitioner.

Even in advanced stages of the disease, when a regular sponge-bath is inadmissible, and indeed impracticable, the patient will derive much comfort, and I believe benefit also, from occasional sponging of the extremities, more especially when hectic is pronounced, and there is much heat and dryness of skin. I have frequently observed, that the application of vinegar and water, in this way, to the chest and limbs, has a decided effect in soothing and inducing natural sleep, and, in some measure, at least, moderating excessive perspirations. It causes a slight moisture of the surface, but this is very different from the draining sweats which often constitute so formidable a symptom.

The importance of the free access of pure air to the lungs, for the right performance of the vital process of respiration, is well known and universally recognised. But it appears to me that too exclusive attention is paid, by many writers, to the palpable changes thus effected, whether in the blood, or in the atmospheric air itself; and that another, and by no means insignificant occurrence, has been greatly overlooked. We take but a

limited view of the functions of the respiratory organs, if we imagine that their sole purpose is to effect the alteration of venous into arterial blood. This is undoubtedly their great and primary work; but they do more than this. They act as purifiers of the blood in another way, and that is, by the throwing off of other matters than carbon, or any of the natural ingredients of the body.

A multitude of facts evidence the truth of this assertion. We eat onions at dinner, and for hours after our breath is tainted with the alliaceous odour. A man indulges in the free use of wine or spirits; he may deny the fact, but the very utterance of the words, as he stands near his questioner, at once convicts him. We direct an ether draught to be taken, and the first salutation of our patient saves us the trouble of inquiring whether our orders have been observed. The different ingredients, or at least a part of them, in these three instances, are manifestly passing out of the economy with the expired air. We have already learned that the same is true of some substances which are not in their nature volatile, seeing that arsenic and the salts of copper, administered by the mouth, have been detected in the bronchial secretions. And we know well, that the active principles of morbid poisons, whatever these may be, do in some instances escape by the same channel, from the proved danger of inhaling the breath of persons labouring under contagious diseases. These things are inexplicable, upon any other supposition than the one stated above.

And if it be so,—if the freeing of the blood from such extraneous, and, if retained, hurtful matters, be one of the operations performed in the lungs, we have here an additional, and a very powerful incentive to due attention, not only to the state of the organs themselves, but also to the quality and amount of the air they are to receive; and we gain, moreover, a further insight into the *reason* why that peculiar atmospheric condition, which experience has shown to be the most favorable, must, of necessity, be the best for consumptive patients.

It may be observed, at once, that extremes, whether of dryness or of moisture, of heat or of cold, are to a greater or less extent injurious. A man in perfect health may be exposed to them all without suffering; but we are not now speaking of such; the individuals whose case we are considering are either the subjects of actual disease, or have within them the seeds of evil, ever ready to germinate and bring forth deadly fruit. For them care is essential, and the choice of their abode a matter of no small moment.

How then do these unhealthy conditions act upon the system?

"A very *dry* air," says Dr. Williams,[1] "the effect of which is increased by its heat or motion, impairs the perspiring power of the skin, and excites various kinds of cutaneous inflammation, often with fever and thirst." The south-east wind, during summer, is peculiarly cha-

[1] Principles of Medicine, p. 483.

racterised by the possession of these obnoxious qualities, as is remarkably exemplified in the south of Europe during the prevalence of the sirocco. "Much of the overpowering influence of this air may be explained by its desiccating operation (manifest not only in animals, by the thirst and feverish dryness of the skin and mouth, but also in plants and trees by the drooping of their leaves), combined with the relaxing agency of heat on the vascular fibre, by which the powers of the circulation are enfeebled, and the purifying processes of respiration and secretion are more or less impaired."

The north-east and due east winds are also exceedingly dry, but withal peculiarly bleak and of penetrating coldness, "and, excepting in persons whose circulation is naturally strong and kept in activity by exercise, their tendency is to check the passage of the blood in the surface, and in mucous membranes, and impair the functions connected therewith."

It is quite clear that, under circumstances such as these, the elimination of morbid matters, either by the lungs or by the skin, cannot take place with due activity; for this elimination is just a part of the healthy respiratory process, and whatever interferes with the perfection of the whole, must impede in like manner each particular step, which makes up that whole.

Again, the opposite condition of air, viz., extreme *dampness*, is alike injurious, and by the production of very analogous ultimate results of non-purification of the blood, though the *modus operandi* is different. I quote once more from Dr. Williams:—"A damp or

moist air, irrespectively of its temperature, may be considered as lower than dry air in its vivifying power, inasmuch as it contains less free oxygen, and has a lower diffusive property to aid in its pervading the lungs in respiration. The greater facility which it affords to processes of decomposition and infection should also be scored against its salubrity, as well as other points in which it may be contrasted with moderately dry air. A warm moist air is universally relaxing, and unless in persons of dry skin, and overbraced vessels, is oppressive and debilitating. Under its influence, perspiration accumulates on the surface, perpetuating its relaxation if warmth continues, and chilling it and impairing its circulation and excretion if cold ensues; and the very evaporation from the moistened surface, which even in mild damp air may occur from draughts or currents, may, under such circumstances, cause an injurious chill. More surely pernicious in this manner is cold damp air, which is proverbially unhealthy, and its disordering action may be in a great measure traced to the physical properties of abstracting heat and electricity, and of checking perspiration and assimilation, which it obviously possesses. Hence ensues the retention of lactic acid in the blood, the formation of oxalic instead of lithic acid, and the imperfect elaboration of the plasma; and these aberrations from the normal chemistry of the body, may manifest themselves in various diseases of the blood and circulation, of which rheumatism, neuralgia, sundry cutaneous affections, cachectic ulcers, tubercle, scrofula, &c., are familiar examples."

It follows, therefore, from what has been above stated, that for all persons of delicate constitution, and very particularly for those who have consumptive tendencies, a moderately dry and warm air is an almost indispensable requisite; and it is likewise apparent that one of the chief reasons of this necessity is the fact, that, under other conditions, the blood is not duly freed from deleterious ingredients.

There are other reasons, too, for the same choice, and for the careful avoidance of sudden or great alternations of temperature, namely, the danger of irritation, or even inflammation, of the lungs, which is incurred by incautious exposure to such atmospheric vicissitudes. But on these I need not delay, for they are well known, and their importance fully recognised.

I must, however, refer for one moment to an additional reason for the removal of phthisical subjects from a bad to a good climate, to which allusion has not yet been made. I mean the opportunity which is thus afforded of more frequent and prolonged out-door exercise. It is possible to regulate the temperature of rooms, so that the patient shall breathe air of an almost uniform heat; and it is also possible, in some measure, to correct unhealthy conditions either of dryness or dampness. But it is *practically* impossible to keep the atmosphere of a house in the same state of purity, as that which circulates without.[1] And the force of

[1] I say *practically impossible*, because in *theory* the thing is perfectly easy. Perhaps the time may come when our dwellings will be so scientifically constructed as to obviate this great objection to an in-door life; but assuredly, as yet, that happy consummation has not been effected.

this observation will be immediately perceived, when we remember that air once breathed (and in a room it is breathed over and over again), is thereby deprived of a large proportion of its free oxygen; and when we reflect that one of the elements of the tubercular constitution is a deficiency of red blood-corpuscles, i. e. of oxygen-carriers, so that a liberal supply of that gas is, in an especial manner, requisite. It is bad enough to have deficient means of conveyance for this all-important agent; it is still worse, when, to this already present deficiency, there is superadded a limited supply even for those which do exist. For we have then two evils instead of one.

I may here shortly notice a theory, which, both from the eminence of its illustrious propounder, and from its own very attractive simplicity, has been received with much favour, and found many advocates; and which, if true, would completely set aside our last argument for open-air exercise in consumptive cases. I mean the view taken by Liebig, that in phthisis there is excessive oxygenation going on, and that this is the true cause of the destructive waste of tissues. For it is very evident, that upon this supposition we are doing all we can to increase the mischief, by sending our patients where they will respire freely in a pure air; seeing that by this method we increase the quantity of the destroying agent, which is received into the lungs at each inhalation. A close, ill-ventilated room would, under such circumstances, be infinitely preferable.

But how stands the case? Clinical experience, the

ultimate and only true test of all medical theories, is completely at variance with this hypothesis. We see that our patients do best when they have the advantage of breathing a pure air, with its full proportion of oxygen, provided its other qualities, in respect of temperature and hygrometric condition, be not injurious; and we see also that their improvement is, in very many cases, closely proportionate to the facilities afforded of respiring freely in such an atmosphere.

And when we come to examine the question a little more closely, the doubt already engendered by these observed facts, becomes greatly increased, if even the certainty of the erroneous nature of the theory be not definitely established.

According to Liebig's view, urea is the result of the oxygenation of uric acid, formed by the metamorphosis of tissue; and the presence of uric-acid deposits in the urine is a measure of the imperfection of this process. In phthisis, therefore, if excessive oxydation were going on, these deposits should not occur, and the uric acid should be, both positively and relatively to the quantity of urea, at a low point. But we know that the urine of consumptive patients is often loaded with such sediments (I have notes of some cases, illustrating this fact, the disease being in various stages, and have observed many more); and the researches of Becquerel clearly show that the supposed law does not hold good.[1] Thus, in chlorosis, a disease of anæmia, in which oxygenation

[1] Vide Golding Bird, on Urinary Deposits, first edit., p. 80.

must be most imperfect, by reason of the deficiency of red blood-corpuscles, he found that the uric acid, instead of being in excess, was positively and relatively below, rather than above, the healthy average. The same, also, was observed in a case of pulmonary emphysema, with intense dyspnœa. While in acute hepatitis, and in phthisis, the uric acid was at a maximum instead of a minimum. Moreover, as Dr. Bird very justly observes,[1] there is another, and a serious objection to the theory, in the instance of diabetes mellitus; for "this disease is, in the majority of cases, complicated with phthisis, indeed, so frequently, that some pathologists have supposed this complication to be a necessary one. Yet here, while phthisical disorganization is going on, and excessive oxydation is supposed to be entirely destroying the tissues of the body, an abundance of highly-carbonised, indeed, a readily oxydisable substance, is generated in the body, circulating in the blood, and escapes by the kidneys. By what ingenuity the fact of the (assumed) excessive oxydation, going on contemporaneously with the copious formation of an inflammable body, sugar, can be reconciled with this hypothesis, I am at a loss to determine."

I would add, that the frequent occurrence of fatty liver, and the increased proportion of fat always present in tubercles, are also inexplicable under the above theory; and that, if it were true, it would scarcely be comprehensible how chlorosis should be so often terminated by confirmed phthisis.

[1] Loc. cit., p. 81, note.

For all these reasons, as well as for others noticed in a former part of this work, we are, I conceive, warranted in rejecting the hypothesis of the great modern chemist, and in adhering to the conclusion to which we have been otherwise led, that a deficiency of oxygen is one of the causes of the phenomena of tubercular disease, and that we are acting most wisely when we place our patients in the most favorable position for the remedying this defect, so far as that may be done with safety.

And this rule applies, not only to cases of developed phthisis, but, also, and perhaps still more essentially, to those in which the disease is merely threatened, that is, to cases in which the tubercular diathesis only exists. At any rate, we have here more chance of success, for the respiratory organs being still sound, the needful stimulus will act upon them with more effect, and they will themselves be able to appropriate a larger amount of the vital pabulum, and to carry on, by its means, the depurating processes with more complete perfection.

Hence it appears that the importance universally attached to the selection of a good climate for scrofulous children, is not only supported by the results of experience, but is in strict accordance also, with the views here advocated, of the essential nature both of the tubercular constitution, and of the disease itself.

But the skin and the lungs are not the only organs by which the depuration of the blood, so much insisted on, is accomplished; and we shall assuredly fall short

of our desired end, if we neglect attending to the state of the liver and the kidneys.

We have already seen that, in the early stages of phthisis, there are frequent evidences of a disordered condition of the liver, manifested in the irregular action of the bowels, and the unhealthy nature of the evacuations. These symptoms must be met by their appropriate remedies; occasional doses of some mild mercurial, as the blue pill, or gray powder; by gentle laxatives; and, above all, by a careful and systematic regulation of the diet. I need not dilate on a subject so familiar to all, further than to make two observations.

The first of these is, that the system of over-active purgation, which was at one time so lamentably prevalent in this country, and which is still far too common, is attended with special and peculiar danger in the cases we are considering. We have already alluded to the very probable explanation given by Dr. Williams of the rationale of the occurrence of ulceration in the intestinal canal in cases of fever, viz. that it is produced by over-excitation of the glandulæ in the process of elimination of the morbid poison, or of the organic results of the operation of that poison; and we have endeavoured to account for the like condition of matters in phthisis in a similar way. Now, if this be so, it is very evident that the practice we are deprecating must, of necessity, tend to bring about the formidable complication in question; and that, not only by the direct and too great stimulus thus applied to a naturally sensitive part, but also by a

sort of reflex action. *Ubi irritatio ibi fluxus*, is an old axiom, which is more generally true than many are inclined to allow, and it is well exemplified, I conceive, in this instance; for by thus continually working upon one set of eliminating organs, we rouse them to an unnatural and undue activity of function, and thus, as it were, force them into disease, and grievously add to our patient's discomfort and danger. Our business is to get rid of certain offending principles, but wisdom would dictate that we should not throw the burden of this labour upon any one single organ, or set of organs. All should take their part, that none may be disproportionately taxed.

My second remark is, that it appears to me both wrong in philosophy, and impossible in successful practice, to lay down any one fixed rule of diet for any class of cases, excepting, perhaps, as respects the two special diseases, diabetes mellitus and scurvy. General rules we may have for our guidance, and derive much advantage from them; but to say that all consumptive patients should live in any one particular manner, appears to me little better than empiricism. It has a semblance of judgment and decision in it, which will impose upon many, but in truth it is neither founded upon reason nor experience. Constitutional peculiarities are infinite in their varieties, and the articles of food most suitable to each particular case are alike various. What will agree with and do good to one, will act like a poison to another; and, therefore, while we set out with the principle, that aliments which are

in their nature indigestible should be scrupulously avoided, and that stimulants usually should be administered with a sparing hand, at least in the early stages of the disease, we must, I maintain, be guided in each case by its own special indications for the construction of a particular scheme, and we must regulate both our orders and our restrictions in strict accordance with the results of the individual's experience, or our own personal observation. In no other way shall we do justice, either to ourselves or to those committed to our charge.

But, if it be true that the necessity for a close attention to the state of the liver and general alimentary apparatus is so commonly received as to need little notice here, excepting in the way of warning, it is, I fear, very much the contrary as regards the kidneys. I do not, of course, mean to affirm that the importance of a healthy condition of the urinary excretion is altogether overlooked, for such an assertion would be ridiculously false; but I suspect that, in the treatment of phthisical cases, our minds have been so much occupied with the lung affection itself, and with the more pressing exigencies of the digestive organs, that we have greatly lost sight of the valuable aid we may receive from the kidneys in furthering the recovery of our patients. Many remedies we are in the habit of using do, indeed, act upon these organs, and we see and appreciate the beneficial results; but our thoughts not having been specially turned to their *modus ope-*

randi, and the necessity for some such action not being firmly impressed upon us, we lose the advantage which might accrue from their intelligent and systematic employment. It is to this point that I desire now to direct my readers' attention, begging them still to remember that the object for which we are contending is the depuration of the blood, by the removal from the system of a specific morbid poison, or its resultants; and in doing this I shall be largely indebted, both for facts and arguments, to the concluding lecture of a very valuable course, delivered lately, by Dr. Golding Bird, at the College of Physicians.[1] I have been long in the habit of using the remedies to be subsequently noticed, and have often witnessed the good they produced; but it is to this distinguished physician that I owe the explanation of the true principle on which they act—a principle which will be found in strict accordance with the theoretical views adopted in this work.

In zymotic diseases, and in some others in which the presence of a *materies morbi* in the blood is quite established, we frequently see the commencement of a return to health coincident with a critical change in the urine, evidenced partly by altered appearances, but chiefly, and indeed essentially, by a sudden increase in the amount of solids existing in it. These solids, it will be remembered, are derived from one, or all, of three sources;—from crude or indigested elements of food which had been absorbed while traversing

[1] Vide Lond. Med. Gaz., vol. xlii, p. 227.

the small intestines, and entered the circulating mass; from the results of imperfect or unhealthy assimilation; and from the products of the metamorphosis of tissue. It is probable that, in tubercular subjects, the whole three yield their quota; and it is certain that the retention of any of them in the blood must give rise to more or less disturbance in the system. This is matter of familiar observation in numberless diseases.

When, therefore, we find that, in cases such as those to which reference was made at the commencement of the last paragraph, recovery has been ushered in by the discharge of these substances, we must conclude that the morbid poison has been thus, in some measure, carried off with them, or, at any rate, that the effete particles which had been either directly produced under its operation, or retained as a consequence of its evil influence, being in this way removed, the blood again becomes healthy, and able to perform its duties in a normal manner. And from this it evidently follows, that in all diseases in which the above-mentioned conditions obtain, it must be a very important therapeutical indication, to further, as much as may be, this essential purification. Have we any means by which such a desirable end can be accomplished?

Dr. Bird answers this question in the affirmative, and shows, I think conclusively, that it may be brought about by the exhibition of a certain class of remedies, viz., the alkalies, their carbonates, and their salts with such acids as in the animal economy are capable of being converted into carbonic acid, namely, the

acetates, tartrates, and citrates. I quote, from the lecture referred to, a very interesting example, in which the influence of one of these salts is *demonstrated:*

"A young lady," he says, "is now, and has been for some time, under my care, labouring, among other things, under a condition of the orifice of the urethra, which prevents her passing water without the aid of a catheter, so as to admit of a very accurate examination of the quantity secreted in twenty-four hours. This, when no medicine was administered, was thus collected and examined; and then three drachms of acetate of potass being administered in the course of twenty-four hours, the urine secreted in that time was collected and examined. The results are shown in this table:

	Without medicine.	After ℥iij Pot. acet.
Quantity of urine in twenty-four hours	℥xvj	℥xlvj
Specific gravity of . .	1·025	1·017
Solids in	416 grs.	782 grs.
Uric acid . .	2·6	3·45
Urea . . .	130·5	202·40
Soluble salts . .	72·0	248·40
Insoluble salts . .	21·6	32·20
Organic matters not included in the above . .	189·3	295·50
	416	782

"The results of these analyses show that, after deducting the excess in the amount of soluble salts arising from the conversion of the acetate of potass into carbonate, the solids of the urine excreted under the influence of the chemical diuretic exceed those recovered without its aid by 190 grs.; and we further learn that, although a large proportion of matter was metamor-

phosed into both uric acid and urea when the remedy was given, still that the greatest increase was in that mixture of organic products set down as extractive, and consisting chiefly of creatine, creatinine, uroxanthin, and matter rich in sulphur. In the example adduced, not only did the patient lose an excess of 30 ounces of water in twenty-four hours, but she *wasted* to the extent of 190 grains more than if no remedy had been given; and to this extent had the blood been depurated of those elements which yielded easiest to the influence of the alkaline salt. In these lectures I have advanced much which tends to limit the influence of the vital force, and have endeavoured to show that it is not the active agent in controlling metamorphic changes; but let me not for a moment be supposed to deny its influence. I regard life as an active agent in controlling organization, and in exerting an influence opposed to chemical or destructive changes,—in a word, as a conservative agent. Now, admitting that the elements of our frames resist chemical influences in the ratio of their vitality, it would follow that such constituents of our fibres as present the greatest departure from health are less highly vitalised, and thus yield the easiest to the chemical force exerted by the alkaline diuretics. On this account it is fair to presume that, when we cause an alkaline carbonate to circulate through the blood, it exerts an influence on the nascent elements of those matters less highly influenced by life, allied to that which it exerts on dead matter, aids their resolution into substances allied to those produced out of

the body, and actually causes the matter to assume so soluble a form as to allow of its ready excretion."

In further corroboration of these views, Dr. Bird alludes to the success obtained by Dr. Brandish with his solution of potass; to the benefit derived from the exhibition of large doses of nitrate of potass in acute rheumatism; to the influence of the alkaline salts in some cutaneous eruptions (and in this my own experience is quite at one with his); and to the fact, that, in his practice, in more than a single instance, a strumously-enlarged cervical gland has yielded to the persistent use of an analogous remedy, even after resisting the iodide of potassium.

The bearing of all this on our present subject is readily apparent. For, as we have already abundantly shown, the blood in phthisical subjects is radically infected, the processes of both the primary and the secondary assimilation are inefficiently performed, and, as a necessary consequence, there must be a large amount of effete matters retained in the system, unless the emunctories, by which they are normally excreted, are kept in a state of activity. This is well understood in theory, and acted upon in practice, so far as the liver and its allied organs are concerned; but from the researches just noticed, we have now learned the important fact, that, by the administration of medicines belonging to the class of chemical diuretics, we may very materially assist in the desired elimination. Indeed, by their aid we can do what we should fail otherwise to effect, for while the liver is the great

channel through which matters, rich in carbon, are removed from the body, it excretes but a proportionally small quantity of nitrogen; and if we neglect the kidneys, we allow the azotised elements of metamorphosed tissue to accumulate, and thus prolong and augment the previously-existing state of disease.

Nor is this our only motive for the employment of the means under consideration. If it be true, as Dr. Bird conceives, and the supposition appears to me to be founded on very just and philosophical views of vital processes,—if it be true that substances less perfectly organized, and consequently less highly vitalised, are the first to yield to the operation of these remedies; then, seeing that tubercle is itself in that condition, and that it is, chemically, remarkable for the large amount of extractive matters which enter into its composition, we may entertain a reasonable hope, that, while in one way we are doing a great and positive good to the system at large, we may also be assisting in the removal of the morbid deposit, which constitutes the essential characteristic of phthisis. For, it will be remembered, it was in these indefinite extractive matters that the most decided increase was observed in the urine of the patient whose case we have narrated; and if we can thus infringe upon the elements of tubercle, we are surely placing it in the condition most favorable for absorption. Moreover, we know that alkalies and their salts act powerfully on albumen out of the body, and though they may not have precisely the same effect when introduced into the living frame,

it is scarcely conceivable that they should be rendered altogether inoperative, and leave the albuminous substances with which they meet perfectly untouched.

I submit, therefore, that in the treatment of consumptive patients it is advisable to have recourse to these saline remedies; not trusting to them alone, nor even chiefly, but using them as valuable adjuncts, for the reasons above indicated. I have followed this plan, in my own practice, for a considerable period, and with manifest advantage; not, indeed, in the absolute removal of tubercular deposits, but, very evidently, in respect of improvement in the general health, diminution of febrile action, and lessening of cough. I adopt it now with the more confidence since I have become acquainted with Dr. Bird's discoveries, because I see *why* it has done the good which I had already observed.

It was stated, in a preceding part of this section, that in the treatment of diseases manifestly originating from morbid poisons, the first indication was to favour the removal of the poison by the natural outlets. I have now shown how the tendency of some of the leading measures, advocated and adopted in the management of phthisis, was evidently towards the accomplishment of the same result, and have endeavoured to impress upon my readers the importance of recognising the object in question as a reality to be attained, and of employing still further means for its accomplishment.

I proceed, therefore, to the consideration of the

second curative indication, viz., the moderation of the fever, which is always present in greater or less severity. But this will not detain us long, for, in truth, the remedies already noticed do all, more or less perfectly, work in this direction. It is only by arresting the disease itself that we can entirely put an end to the symptomatic fever; and, whatever aids in diminishing the activity of its progress, will, in the same measure, decrease the amount of vascular excitement and general disturbance, which make up the febrile phenomena. In aiming, therefore, at the removal of the *materies morbi*, and in keeping strict watch over the state of the secreting and excreting organs, we are doing that which is most likely to accomplish our object. To administer remedies for the simple purpose of lowering the pulse without reference to any deeper or ulterior effects, appears to me most unphilosophical, and quite in opposition to the true theory of the disease. We may give medicine, digitalis for example, till we almost paralyse the heart, but in so doing we shall be efficacious for evil only, not for good.

The *third* indication was the checking of undue local excitement; and this is a matter of no small moment, for, while often dangerous in themselves, they are always injurious in their after-effects.

There are two ways, as it appears to me, in which these local mischiefs may be brought about. They may be the result of abnormal functional activity in the organs affected, or they may arise from the ope-

ration of external agencies. We shall best avoid the former, by taking good care that the burden be not unequally thrown on any one organ, or set of organs, and by endeavouring, so far as may be, to keep all parts of the system in a condition of quiet but effective working. The latter will be obviated by close attention to correct hygienic rules, as respects temperature, diet, &c.

But in spite of all our precautions, in very many cases these unfortunate complications will occur, and they must then be met and remedied with promptitude, for delays are fraught with peril.

Their most common seat is, undoubtedly, the lungs; and the forms under which they are manifested are, usually, congestion, inflammation, or hæmoptysis, the last mentioned being very often the natural, but exceedingly unpleasant, and sometimes formidably dangerous, method by which the first is removed.

I have little to say on any one of these points, for the principle of their treatment is well understood, and my own experience has been merely corroborative of what has been so frequently recorded. We remove congestion by relieving, as directly as is possible, the embarrassed capillaries, and this is best done by moderate local depletions, counter-irritation, and the use of salines and antimony. The same means, but more energetically employed, are applicable to the management of inflammations, unless they be of such an extent as to require severer remedies, in which case the treatment recommended for acute phthisis is that which should be adopted.

In hæmoptysis, I very rarely indeed have found it necessary to abstract blood from a vein, leeches or cupping having proved quite sufficient when any depletion appeared needful. Mild cases have generally yielded readily to cooling aperients, with the nitrate of potass; and when the bleeding has been to any extent, I have seldom failed in checking it by the use of acetate of lead. Gallic acid has been much recommended for the same purpose, but in my hands it has proved of very inferior value, and I never prescribe it now. I have used the lead freely, in these and in other cases, and have never seen any bad results follow. If proper and self-evident precautions be taken, I believe it is a perfectly safe, and assuredly it is a most efficacious remedy. Dr. Todd's case, quoted in a former section, probably explains *why* such is the case, for by it we see that lead is especially attracted to the lungs.

Much may be done, in the way of warding off these attacks, by systematic stimulation of the surface of the chest, not carrying it so far as to produce absolute counter-irritation, but merely brisk excitement of the cutaneous capillaries. For this purpose many means may be employed, such as, diligent friction with a hair glove, or with a rough towel impregnated with salt, or, what is far more efficacious, the strong acetic acid, either combined with turpentine, or with the addition of a proportion of the acetum lyttæ. The last[1] is what

[1] ℞ Acet. lyttæ,
Spt. camph., āā ℥ss;
Acid. acet. fort., ℥iij. Ft. lotio.

I now most generally prescribe, and with most advantage. It is cleanly and agreeable, works easily into the skin, and if used freely can produce a very considerable amount of local excitement. I may mention here, that I have found nothing more effectual in relieving the flying pains, of which consumptive patients so frequently complain, than a liniment containing belladonna, opium, and ammonia.[1] Mustard cataplasms, dry-cupping, the application of very strong ammonia for a few seconds, or nitro-muriatic acid brushed lightly over the surface, are also, each in their own way, useful appliances.

But it is not in the lungs only that the abnormal local excitements, of which we are speaking, take place. The intestinal mucous membrane, and, more especially, the mucous glandulæ, are their very frequent seat, and the diarrhœa thus produced, is alike one of the most distressing and most formidable complications with which we have to contend. I believe that in many cases it is impossible, with all our care, to prevent frequent attacks of this kind, the proclivity to this particular form of irritation being altogether too strong for us; and I think I have observed something like an epidemic constitution in this respect; certainly some seasons have presented an unusual preponderance of such cases, while in others hæmoptysis has been the most common complication. But, ordinarily, much may be done in the

[1] ℞ Liquor. bellad. (Hooper's), ʒij;
Linim. opii, ʒx;
Linim. camph. c., ℥iss. Ft. linim.

way of prevention. I am referring, let it be remembered, to attacks of diarrhœa occurring during the progress of phthisis, not to that which so very often sets in just before death, and is the final agent in destroying the sufferer.

What, then, are these preventive means? Mainly, as I conceive, the careful regulation of the diet, the avoidance of all articles of food or drink which experience has shown to be injurious in the particular case before us, and a diligent attention to the state of the bowels. The impropriety and danger of constant active purgation have been already pointed out; but fears of this kind must not restrain us from the exhibition of such gentle laxatives as will secure a regular action of the intestinal canal, for retained excrementitious matter will of itself produce the very evil we dread. Meddlesome interference is most mischievous, but neglect is almost equally bad.

Many practitioners have a great dread of vegetables, and rigidly exclude them from the tables of their consumptive patients; while others forbid the use of butter, and of all forms of bread excepting biscuit or dry toast. It appears to me, that such strict rules are not merely needless, but absolutely injurious. It is perfectly clear, from the researches of modern chemists, that a certain proportion of fresh vegetables is essential to the maintenance of perfect health; that the system requires this admixture for the right performance of its various functions. In phthisis the nutritive processes are already carried on in an inefficient manner, and the

textures, as we have seen, are not satisfactorily built up. It is surely a strange way of meeting this evil, by abstracting what is necessary for the formation of good blood. Are we not thus diminishing, rather than adding to the chances of recovery? Uncooked vegetables, pickles, &c., should be altogether laid aside, with other indigestibles; but well-dressed vegetables, with some few exceptions, are not only harmless, when taken moderately, but I believe also useful.

But when symptoms of irritation are threatening, or already set up, how should we treat them? At the very commencement I have seen an alterative dose of mercury, followed by some warm aperient, and the friction of the abdomen with the belladonna liniment above noticed, exceedingly beneficial, removing the uneasiness at once, and restoring the secretions to a healthy condition. If diarrhœa have begun, the chalk mixture, with aromatic confection, and small doses of opium, will often check it. If it be really severe, we must have recourse to the acetate of lead and opium, than which I know nothing more generally successful. Or we may give the trisnitrate of bismuth with magnesia, as recommended by Dr. Theophilus Thompson, in whose hands it has proved singularly useful.[1] I have made a few trials of it with good success; but my experience of its efficacy in the diarrhœa of phthisis has not been sufficiently extensive to warrant my speaking with confidence. In cases of irritation of the stomach and

[1] Medical Times, July 29, 1848, p. 204.

bowels, unconnected with tubercular disease, I have used it largely, and have a high opinion of its value. In many cases of dyspepsia, especially where there is much sickness, and in sympathetic vomiting, I have often found it act like a charm. When the tongue is smooth and bright red, or when it is spotted with aphthæ, I have seen the greatest benefit follow the exhibition of the biborate of soda, a medicine which has fallen into most undeserved neglect. I generally give it in about ten-grain doses, in mixture with the compound tragacanth powder, and the relief procured is often most decided. Nitrate of silver is also, in many cases, an excellent remedy; and great advantage will very generally be derived from the use of small injections of starch and opium. This, however, is more of a mere palliative than the others, which are calculated to produce more or less of a local action on the mucous membranes along which they pass, and thus to influence the disease more directly and more powerfully.

In the entire treatment, the objects to be kept in view are twofold—the subduing of nervous and vascular irritation, and the effecting a change in the nutritive processes of the affected organs. If these be realized in the mind, we can scarcely go far wrong in our choice of remedies.

I have said nothing of simple astringents, because they will naturally suggest themselves to every practitioner; but I may remark that, occasionally, I have known the logwood succeed when all other appliances had failed.

The fourth and last general indication to which reference was made, is the support of the system at large; and it is scarcely possible to overrate the importance of this object. Phthisis, in common with all other forms of tubercular disease, is essentially characterised by diminished power. There may be activity, and that even to an extent that is most dangerous; but there is no real organic strength. The energy exhibited is false and self-destructive; and if we allow ourselves to be deceived upon this point, and treat our patients as we should those of sounder constitutions, under similar circumstances of local or general excitation, we shall assuredly fall short of our aim, and injure rather than benefit them. The knowledge of this fact is one of the many advantages we have derived from our present better acquaintance with the real nature of the disease; and in it we see another marked analogy with those diseases which manifestly originate in morbid poisons. In them, as in phthisis, too vigorous antiphlogistic treatment is full of peril.

Let it, then, ever be remembered that the phenomena of pulmonary consumption have, all of them, this one special character, and that each separate action which contributes to the formation of the entire disease, is not only dependent upon innate debility for its origin, but is, in itself, productive of increased weakness. That the fever, the cough, the expectoration, the night-sweats, the primary deposition of tubercle, and its subsequent softening and expulsion, all tend in the same direction, all unite in the process of continued wasting. So that

it is peculiarly imperative upon us, to employ such general means as will give tone to the enfeebled fibres, and aid, if it may be, in the construction of better tissues. We cannot *physic* the poison out of the system, but we may help forwards its elimination, and we shall best secure this end by striving to keep the vital powers at their highest point of healthy energy, while at the same time we repress all undue and hurtful action.

Many of the therapeutic and hygienic rules already laid down, bear upon this point, as well as on those to which they more particularly referred; for, it is self-evident, that whatsoever conduces to the production of a healthy state of the various organs of secretion and excretion, and tends to improve the condition of the digestive organs, must of necessity be *pro tanto* efficacious in imparting strength to the system at large. But there are other remedies which have not yet been noticed, and which are employed strictly and avowedly for the purpose now indicated; I mean the class of tonic medicines, and on some of these I would make a few remarks.

In examining into the condition of the blood in phthisis and scrofula, we found that the most constant abnormal change was a diminution in the relative proportion of red corpuscles; and reasons were adduced for the belief that this defect was one of the immediate agents in the production of tubercle. Such being the case, it would appear a most manifest indication to supply this want, and bring up the corpuscles to their right standard. And for this purpose we are at once

reminded of the proved efficacy of iron, as evidenced in its operation in cases of simple anæmia, and in such diseases as chlorosis, in which the deficiency in question forms a prominent ingredient.

Nor does experience contradict the inductions of this analogical reasoning, for there is, perhaps, no one single member of the tonic division of remedies more frequently and more manifestly useful in the treatment of many cases of phthisis. When the hæmoptysical tendency is very pronounced, it is certainly contra-indicated, at least, until that tendency has been removed by other means; and in some cases it appears unsuitable, from its liability to derange the digestive organs. But these last are exceptional cases; there are comparatively very few that will not bear it in some one of its many forms. The ammonio-citrate has appeared to me the form least likely to disagree, and it can be made exceedingly palatable by administering it in good lemonade; I generally add a proportion of ammonia to it. The saccharated carbonate, of the Edinburgh Pharmacopœia, is also an excellent preparation, infinitely superior to the old carbonate, and active in much smaller doses. The iodide, though occasionally of great use, has appeared to me far more injurious to the stomach, than most of the other forms, and I have met with many cases in which it could not be borne at all. Do we in this, and similar chemical compounds, really derive the benefit of two combined actions? Or do they not rather act simply as modifications of one or other of the ingredients? I suspect the question yet remains to be decided.

In females, the absence of the catamenia, or their irregularity, or defective quantity, affords, of course, an additional indication for the use of chalybeates; and generally it may be stated, they agree best, and do most good, when the circulation is feeble, though at times accelerated, and when the general hue of the skin is pallid, and the extremities cold.

From the results of some of his experiments, Mr. Blake is inclined to believe, that the salts of iron facilitate the passage of the blood through the capillaries. If this observation be correct, we can see in it an additional reason for their beneficial operation; for it is quite apparent that the physiological changes of respiration, so all-important to the well-being of the entire economy, must be in this manner rendered more complete, while the nutritive processes, carried on in all the tissues, by the agency of the same class of vessels, will also be assisted.

Quinine I have often found a valuable adjuvant, and I have thought that it has been most strikingly beneficial when the phenomena have shown a tendency to assume a sort of periodical type. Benefit will also be derived in many cases from the employment of other vegetable bitters, as calumbo, or chamomile, or cusparia, the latter especially when the bowels are irritable, and the evacuations somewhat loose.

Iodine, and cod-liver oil, though not strictly tonics in the general acceptation of the term, may be included under the same head, because in whatever way they specially act, the ulterior effect of both, when they do

good at all, is to improve the state of the system at large, to increase the powers of digestion, to bring about a more healthy nutrition, and thus, as a consequence, to increase the strength.

The precise mode of action of iodine and its compounds is not, perhaps, as yet satisfactorily ascertained; but it is abundantly evident that it does exert a widespread and decided influence upon the living body. Like the ferruginous salts, it would appear to increase the freedom of the capillary circulation; and, probably as a consequence of this, it augments the secretions, and favours those actions by which absorption is carried on. When taken into the system, it rapidly enters the blood, and is eliminated through many channels, as has been conclusively demonstrated by the detection of its presence in the urine, the perspiration, the saliva, the milk, &c. And while thus passing out of the body, it must, as has been already shown, modify, to a greater or less extent, the nutritive processes of the parts which it traverses. This is evidenced by the effects produced in the treatment of many diseases; for example, in the removal of bronchocele, and the cure of nodes, and syphilitic eruptions of the skin, and ulcerations of the throat.

In scrofula, commonly so called, its value as a therapeutic agent is established, and there is reason to believe that it often proves beneficial in that particular form of the disease which we are studying. But, at least as far as my own experience goes, it has appeared less trustworthy, and less certain in its operation, when

the lungs have been the seat of tubercle, than when the subcutaneous glands, or other tissues, were the parts chiefly affected; and in many cases it is contra-indicated by the irritable condition of the digestive mucous membranes. The iodide of potassium is certainly the form least likely to disagree, and the one which holds out the greatest prospect of success; because, if it be to do good at all, its use must be persisted in for a considerable time, and the irritant properties of the pure iodine render this scarcely practicable.

I have not seen the benefit from *Iodine Inhalations*, which Sir C. Scudamore and some others appear to have witnessed; and I cannot but think there is a lurking fallacy in the arguments by which the superiority of this particular method of exhibition of remedies is supported. If phthisis be, as we have seen such strong reasons for believing, a *general* disease, dependent upon the existence of a certain morbid poison in the system, it is clear that our remedies, to prove curative, must be general also; they must enter the circulation, and work largely throughout the whole body. If tubercle be a product of abnormal nutrition, consequent upon the fore-existing presence of that poison, we must labour, not only to get rid of the cause itself, if that be possible,—or to render it innocuous, if we cannot carry it away,—but also to bring the nutritive processes into a healthy state; and for this purpose again, our remedies must be blood-remedies.

Such being our aim, it appears to me that the intro-

duction of the therapeutic agent effectually is the main point, and that the channel by which it enters is a very secondary consideration. I doubt if we should modify the nutrition of the pulmonary tissues more effectually by applying the iodine directly to them, than by giving it in the more ordinary way, and having it carried to them with the blood. And there are objections to the practice, from the local irritation which is liable to be produced. May we not also lose some advantage from the absence of those vital influences to which medicines are subjected in the stomach? Nor does it necessarily follow that because iodine, when given by the mouth, manifests certain physiological properties, it must exert the same when introduced directly by the lungs. The actions of ether and chloroform, when taken into the stomach, are very different, both in kind and degree, from those which follow their inhalation.

I may here also remark, that, though I have undoubtedly seen cough relieved by sedatives administered in vapour, I have not found by any means the same amount of benefit as from the same drugs given by the mouth. And we are in this way sadly restricted in our appliances, seeing that many, and those some of the most important, agents are altogether unvaporisable, and therefore useless for this purpose. I much more rarely now order inhalations than I did a few years ago.

The Cod-liver Oil is a remedy of far more unquestionable efficacy. I have prescribed it largely during the last three years, and my confidence in its powers con-

tinually increases. It is not a *specific;* it will not destroy, nor infallibly counteract the morbid poison on which tubercular disease depends; and if we give it with this view, and omit the other points of treatment to which reference has been made above, I believe we shall be frequently disappointed, and that it, like other useful articles of the Materia Medica, will again fall into unmerited neglect.

But though it wants this desirable quality, it is a therapeutic agent of the utmost value, from its very manifest influence upon the constitution generally. When administered in a favorable case, and with proper precautions, it speedily improves the state of nutrition throughout the entire frame; the appetite increases, and digestion is more thoroughly performed; the patient gains flesh and strength; the secretions become more healthy; the cough is diminished; and the hectic much mitigated, or even removed. In fact, there is a return, more or less perfect, to a normal condition of all the functions; and, consequently, the patient is brought into the best possible position for getting rid of his disease altogether, or, at any rate, for resisting effectually its further encroachments.

These are great things to be accomplished, but, as Dr. Williams remarks,[1] such a result is not "surprising, when we consider that the nuclei or rudimentary molecules of all structure, appear to consist of fat, which the oil, in its highly divisible state, supplies

[1] Principles of Medicine, p. 404.

and renews in the manner most conducive to active and healthy nutrition. Its peculiar fluidity and little proneness to change also enable it to pervade all structures, and to penetrate even into imperfectly-organized deposits, and by softening their concrete fatty molecules, and rendering more permeable and supple the whole mass, brings them more under the influence of the adjoining living parts, through the circulation in which either their vitality and nutrition are improved and maintained, or if incapable of improvement, they are gradually dissolved and absorbed away."

It is very probable, that in the above extract we have a near approach to the correct explanation of the true *modus operandi* of the remedy; but it is not the one universally adopted.

It was at one time the general belief that the efficacy of the oil depended upon combined iodine, and we were cautioned not to be too anxious regarding its purification, seeing that during the processes employed for this purpose, the iodine ran a considerable chance of being altogether removed; so that in our efforts to please our patient's palate, we were in danger of administering a worthless medicine. But experience has not borne out these views. The purest oil generally agrees best, and does most good; and it is by no means clear that the iodine has any great share in the work done. In the first place, it does not appear to be an invariable ingredient, even of good specimens. Secondly, when present it is in exceedingly minute

quantities. And, thirdly, it will often answer in cases which had been previously treated with iodine, in various ways and various doses, without any success.

I do not affirm that these are conclusive arguments against the supposition, that the iodine has something to do with the good results observed, because they are susceptible of explanations, which would leave the principle intact. The chemist may fail to discover what is actually present, and a very minute quantity of an active substance may produce effects when administered as a *natural compound*, which it would not do when forming a part of a merely artificial mixture. Witness the different efficacy of the natural mineral waters, and of our imitations of them. But I think they are sufficient to throw great doubts upon the hypothesis, and to show that more precise demonstration is required for its establishment.

The followers of Liebig, again, believe that it acts by supplying a material for combustion, and thus obviating the destruction of tissue by the oxygen, which they conceive to exist in excess. I have already stated my reasons for demurring to this view, and need not reproduce them ; but I would observe that if this chemical theory were correct, other hydro-carbonaceous matters would answer the purpose quite as well as the cod oil ; and this is opposed to all experience.

But whatever be the true theoretical explanation, the practical facts remain the same ; and I cannot too strongly urge upon my professional brethren, the advisableness of giving a full trial to the medicine in

question. It is certainly an unpleasant remedy, but it is surprising how soon, in most cases, the dislike to it passes away, and how frequently it is given up with reluctance, when circumstances call for a temporary suspension.

At the commencement of the treatment it should be given in small doses,—a teaspoonful once or twice a day, till the stomach has become accustomed to it; and then the dose should be gradually increased, until three tablespoonfuls, or more, are taken in each twenty-four hours.

I have tried many menstrua, and have found that milk is the one most generally preferred. The proper dose of oil should be put in a bottle, with about three times its bulk of milk. The whole should be then well shaken, until an emulsion is formed. Some patients prefer taking it plain, others floating on simple water, or an aromatic. Any of these methods will answer; but the production of an emulsion with an alkali, is, it appears to me, a very objectionable mode, and one likely to destroy the efficacy of the medicine.

I have rarely seen any bad effects, even from its prolonged use; but occasionally there is some gastric disturbance, and when this occurs, its administration must be suspended for a time. It is also contra-indicated when there is a marked tendency to hæmoptysis, when inflammatory symptoms present themselves, or when there is diarrhœa.

The trials which I have made of Naphtha have not given me any confidence in it, as a remedial agent in phthisis. I cannot say that I ever saw any appreciable

good results, beyond temporary relief of dyspnœa. Dr. Blakiston gave it in 100 cases, and with equal want of success.

In regard to special remedies for particular symptoms, I have little to communicate. Of all sedatives, morphia has appeared to me the most generally useful for allaying the constant irritating cough, which so often harasses the consumptive patient, and it may be persevered in for a considerable time, without producing any bad effects. I have also found stramonium lozenges useful, especially when the larynx was affected.

Pure tannin has appeared sometimes to check the night-sweats; and I have also seen benefit in the same way from small doses—two or three grains—of Dover's powder. Both these remedies have one good property in common, that they may be administered when there is a tendency to diarrhœa, which precludes the employment of the mineral acids.

Some cases have appeared to derive benefit from the permanent discharge of a seton or issue; but, as a general rule, I prefer the repetition of blisters, whenever circumstances call for counter-irritation, or the occasional use of croton oil, or the tartar emetic.

When the larynx is ulcerated, the most efficacious treatment is undoubtedly the application of a strong solution of lunar caustic directly to the glottis. Even if the ulcerations cannot be healed, great relief will be thus obtained, the pain being removed, and the difficulty of swallowing much diminished.

APPENDIX.

THE CLIMATE OF TORQUAY.

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In the following observations my object is simply to examine those features in the climate of Torquay, which have a special bearing upon its fitness or unfitness as a residence for consumptive patients, and many of which have been very generally and very greatly misrepresented. My remarks will, therefore, be limited both in extent and in character, many subjects of interest connected with the locality in its external aspect, its natural history, and its influence upon disease in general, being altogether omitted.

Torquay is situated in a cove, at the north-west angle of Torbay. This cove opens to the south-west, and is bounded by three hills of nearly equal elevation —from 180 to 200 feet. The hills are separated by two tortuous valleys, one running towards the east, and the other towards the north. The town is built in the cove, along the slopes of the hills, and in the gorges of the valleys. It is well sheltered from the north and east, the majority of the houses facing either south or south-west. The small town of Torre lies at the extremity of the valley, which runs northward, and is connected with Torquay by a continuous line of buildings.

The geological formation of the district, included within these boundaries, consists almost entirely of limestone.

The climate of the south-west coast of England is described, by all writers, to be soft and humid; and though Torquay is allowed to be in some measure drier than other parts of the same line of country—a fact of which various explanations have been offered, it is still universally believed to be essentially damp and relaxing. The following tables, for which I am indebted to a lecture published in September 1846, by my friend, E. Vivian, Esq., and to a meteorological journal, very accurately kept by the same gentleman, will, I think, show that this so common opinion requires some modification.

Mr. Vivian's observations were made at Woodfield, which is situated on the north-western side of one of the hills, and is consequently neither so warm, nor so well sheltered, as many other parts of the town. Still I prefer making use of them, to the exclusion of other records, because they extend over a greater space of time, and are consequently more valuable for the purpose of comparison, and because I would rather understate than exaggerate.

The first table shows the mean temperature at Torquay, from 1842 to 1845 inclusive. The data for the other places, mentioned here and below, are derived from the last edition of Sir James Clark's work on Climate, from the Report of the Registrar-General,

from Dr. Shapter's 'Climate of Devon,' and from the observations taken at the Bristol Institution :

TABLE I.

MEAN TEMPERATURE.

	Annual.	Winter.	Spring.	Summer.	Autumn.
Torquay (Woodfield) . .	52·1	44·0	50·0	61·2	53·1
Cove	51·9	44·1	50·1	61·3	52·0
Penzance	51·8	44·0	49·6	60·2	53·3
Undercliff	51·3	41·8	49·6	60·6	53·5
Clifton	51·2	39·9	49·7	63·8	51·4
Exeter	51·2	41·4	49·5	62·0	51·9
Hastings	50·4	39·0	47·4	61·7	52·2
London	50·3	39·1	48·7	62·3	51·3
Sidmouth	50·1	40·3	48·1	60·2	51·6
Chiswick	49·9	38·6	48·5	62·2	50·1
Newport (Isle of Wight) .	49·7	38·5	48·1	61·1	50·6
Nice	59·4	47·8	56·2	72·2	61·6
Rome	—	46·8	—	—	—
Madeira	64·9	60·6	62·3	69·5	67·3

TABLE II.

MEAN EXTREME RANGE OF TEMPERATURE.

	Annual.	Winter.	Spring.	Summer.	Autumn.
Torquay (Woodfield)	51	29	42	30	38
Cove	48	26	39	34	32
Penzance	49	27	33	27	32
Undercliff	57	29	43	35	42
Clifton	59	33	44	30	46
Exeter	59	29	43	36	43
Hastings	61	33	44	39	41
London	64	32	46	48	48
Sidmouth	57	31	43	35	43
Chiswick	67	38	54	44	53
Newport	59	31	48	41	52
Nice	60	32	36	29	39
Rome	62	31	43	31	46
Madeira	31	21	22	24	25

The next table shows the mean daily range of tem-

perature at Torquay, during one year, and is thus illustrative of a very essential element of climate, when considered in reference to its eligibility as a residence for invalids.

TABLE III.

MEAN DAILY RANGE OF TEMPERATURE AT TORQUAY, DURING THE YEAR 1847.

January	6·9°	
February	8·3	mean = 8·23.
March	9·5	
April	11·1	
May	12·8	mean = 12·83.
June	14·6	
July	15·5	
August	12·8	mean = 13·16.
September	11·2	
October	7·6	
November	7·7	mean = 7·33.
December	6·7	

From this it appears, that the mean daily range of temperature, during the first three months of this year, was 8·23; and if we compare the numbers given in the second division of Sir James Clark's third table, we find that during corresponding months, the range at Undercliff is 9·02, at Hastings, 9·00, at Naples, 10·00; and at Rome, 11·00.

In the following table, constructed by Mr. Vivian from the data contained in the Quarterly Reports of the Registrar-General, we have a valuable comparative sketch, both of the temperature and the humidity of

the air in Torquay, and in England generally. "The series commences from the 1st of April, 1847, and affords the only statement of the comparative meteorology of the several districts of this country upon which any reliance can be placed, having been founded upon observations taken at the same time, and with instruments regulated by the standard of the Greenwich observatory.

TABLE IV.

TEMPERATURE.

To 30th June, 1847.	Highest extreme.	Lowest extreme.	Mean Temper.	Range of Temp.
Torquay	75	31	52·7	44
Average of England . .	78	27	50·9	51
Extreme of ditto . . .	87	19	,,	65
To 30th September, 1847.				
Torquay.	80	44	60·5	36
Average of England . . .	82	36	58·2	46
Extreme of ditto . . .	98	20	,,	68
To 31st December, 1847.				
Torquay	64	31	49·4	33
Average of England . .	67	26	45·8	50
Extreme of ditto . . .	73	14	,,	55
To 31st March, 1848.				
Torquay	57	26	43·1	31
Average of England . .	62	16	38·1	45
Extreme of ditto . . .	71	4	,,	56
To 30th June, 1848.				
Torquay	72	37	55·6	35
Average of England . .	79	28	53·4	50
Extreme of ditto . . .	88	23	,,	65
To 30th September, 1848.				
Torquay	75	46	58·0	29
Average of England . .	82	36	57·4	46
Extreme of ditto . . .	95	29	,,	60

HUMIDITY OF THE AIR AND FALL OF RAIN.

	Days of Rain.	Inches of Rain.	Vapour in cubic foot of air.	Additional vapour to saturate do.
To 30th June, 1847.				
Torquay	39	5·1	3·7 gr.	0·7 gr.
Average of England .	42	6·3	3·7 „	0·7 „
Extreme of England .	58	10·6	4·1 „	0·3 „
To 30th September, 1847.				
Torquay	21	3·5	4·7 gr.	1·2 gr.
Average of England .	32	4·6	4·8 „	0·9 „
Extreme of England .	46	9·3	5·0 „	0·2 „
To 31st December, 1847.				
Torquay	43	13·7	3·8 gr.	0·4 gr.
Average of England .	43	9·1	3·4 „	0·3 „
Extreme of England .	61	18·6	4·0 „	0·1 „
To 31st March, 1848.				
Torquay	52	9·3	3·0 gr.	0·4 gr.
Average of England .	52	9·6	2·7 „	0·3 „
Extreme of England .	67	16·1	3·1 „	0·1 „
To 30th June, 1848.				
Torquay	38	9·1	4·0 gr.	1·1 gr.
Average of England .	43	8·1	3·8 „	1·1 „
Extreme of England .	59	11·6	4·1 „	0·8 „
To 30th September, 1848.				
Torquay	49	10·4	4·7 gr.	1·2 gr.
Average of England .	50	10·3	4·5 „	1·0 „
Extreme of England .	61	15·2	5·0 „	0·7 „

The second division of the preceding Table introduces us to a very important branch of our inquiry regarding the climate of any place, considered as a proper locality for invalids, viz., its humidity; and as it is upon this point that some of the most erroneous opinions are held concerning Torquay, I shall enter into a few more details, and exhibit the results obtained by inquiries embracing several years. In doing this,

I again quote from Mr. Vivian's pamphlet, to which reference was made at the commencement of this Appendix.

TABLE V.

AVERAGE NUMBER OF DAYS UPON WHICH RAIN FALLS.

	Annual.	Winter.	Spring.	Summer.	Autumn.
Torquay	132	35	30	32	35
Cove	131	37	29	30	35
Penzance	178	50	40	39	48
Undercliff	146	39	32	33	42
Clifton	169	45	36	41	45
Exeter	162	42	36	41	41
Hastings	153	39	31	33	49
London	178	48	43	44	43
Sidmouth	141	40	33	32	35
Newport (I. of Wight)	185	49	45	42	49
Grassmere	196	56	39	47	57
Rome	117	35	30	17	34
Madeira	70	23	18	6	22

TABLE VI.

QUANTITY OF RAIN IN INCHES.

	Annual.	Winter.	Spring.	Summer.	Autumn.
Torquay	28·20	6·82	5·61	6·38	9·39
Cove	33·25	10·54	4·05	7·05	11·92
Penzance	44·66	12·64	9·35	9·34	13·33
Undercliff	23·48	4·65	4·06	4·29	9·48
Clifton	32·56	8·43	5·69	9·44	9·00
Exeter	31·90	9·10	6·55	7·10	9·20
Hastings	32·81	7·59	5·80	6·40	13·02
London	24·80	5·85	4·80	6·67	7·43
Sidmouth	22·68	5·29	5·57	5·66	7·46
Chiswick	24·04	4·66	4·58	6·79	8·01
Newport	33·60	7·87	6·45	6·48	12·90
Grassmere	121·00	40·88	18·66	21·28	40·04
Nice	26·81	7·30	6·64	2·75	10·12
Rome	31·11	9·49	6·29	4·16	11·17
Madeira	29·23	11·40	5·77	1·45	10·61

From these results the following two tables are calculated, exhibiting the position which Torquay occupies as compared with the average of the other places specified.

TABLE VII.

AVERAGE NUMBER OF DAYS UPON WHICH RAIN FALLS.

	Annual.	Winter.	Spring.	Summer.	Autumn.
Torquay	132	35	30	32	35
Average of other places . .	160	43	36	37	43
Difference in favour of Torquay	28	8	6	5	8

TABLE VIII.

QUANTITY OF RAIN IN INCHES.

	Annual.	Winter.	Spring.	Summer.	Autumn.
Torquay	28·20	6·82	5·61	6·38	9·39
Average of other places . .	30·37	7·66	5·69	6·92	10·17
Difference in favour of Torquay	2·17	0·84	0·08	0·54	0·78

Grassmere is not included in this average, the fall of rain in the Lake districts being so excessive.

Sir James Clark, in speaking of Clifton, states that "the fall of rain is absolutely less here than in Devonshire and Cornwall, and much the same as on the South coast. The result of ten years' observation at the Bristol Philosophical Institution is 32 inches for the year."[1] Table VI above shows that there is an error in this statement, for the average annual fall at Torquay is 28·20 inches; and the comparative dryness of the air in this locality is also well shown in the following Table, which is compiled from observations

[1] Influence of Climate, fourth edit., p. 169.

taken at the Bristol Institution, and at Woodfield Torquay, during the years 1842—5.

TABLE IX.

TORQUAY.

	Winter.	Spring.	Summer.	Autumn.	Annual.
Temperature	43·5	55·4	59·9	49·5	52·7
Dew-point	39·4	47·4	53·6	45·3	45·9
Difference	4·1	8·0	6·3	4·2	6·8

BRISTOL.

	Winter.	Spring.	Summer.	Autumn.	Annual.
Temperature	41·3	56·8	62·4	47·6	52·2
Dew-point	38·7	51·5	57·7	46·5	48·6
Difference	2·6	5·3	4·7	1·1	3·6

From this statement it appears that Torquay is *sensibly* drier than Bristol by 1·5 degrees in winter, and by 2·7 degrees in spring, at which season it is also *absolutely* drier by 4·1 degrees. On the whole year there is a difference of 3·2 degrees of *sensible*, and 2·7 degrees of *absolute* dryness in favour of Torquay.

On the whole, it will be gathered from the preceding data that the most important feature in the climate of Torquay is its *equability*, both as regards the temperature and the humidity of the atmosphere. In respect of the former of these, viz. the equability of temperature, it is surpassed only by Cove and Penzance, and that very slightly; while it has the advantage over all the others, the annual range at Undercliff being 6 degrees more, at Clifton 7 degrees, and at Hastings 10 degrees.

It is also evident that it is not so hot in summer as is generally supposed; for the highest point registered during the year 1847 in Torquay was 80 degrees; and in 1848, 75 degrees; while in some other parts of England it was as high as 98 and 95 degrees at the same periods. In like manner, the greatest cold in Torquay during 1848 was 26 degrees; and in some other parts of England it was 4 degrees.

The equability of the atmospheric humidity is proved by the fact, that, during the same periods, the greatest amount of vapour in a cubic foot of air, showing the *actual* humidity, was 4·7 grains, and the least 3·0 grains; while, on the average of England, the amount varied from 4·8 to 2·7 grains.

These results are manifestly dependent upon its peculiar geographical position, and chiefly upon the proximity of the sea, which not only encircles the great peninsula of the western counties, but also the smaller promontory on which the major part of the town is built, and of which a line drawn from Torre Abbey sands to Babbicombe forms the base. For, by reason of this, the wind in every point to the southward of north-east and west is a sea breeze.

It is, perhaps, scarcely necessary to remark that, in the above tables, every day on which there has been any, however slight, deposit of water from the atmosphere, is set down as a *rainy-day*; so that it would be an entire mistake, to imagine that on all days thus designated, the weather was such as necessarily to confine invalids to the house. In the Monthly

Meteorological Reports for 1847, now lying before me, I find that in January there were eighteen rainy days, but out of this number the fall was continuous only on two; on the others there were merely showers, several being specially noticed as *fine* in the intervals. In February fourteen days of rain are noted; but in none of them was the whole day wet, while five are particularly marked as being fine, with the showers. In March there were thirteen rainy days, all being partial, and nine of them recorded as fine also.

These are noticed merely by way of example, and as illustrating the fact that, during three of the most unfavorable months of the year, the number of days on which out-door exercise was possible, was considerably greater than might have been anticipated from inspection of the table of rainy days. Nor is this a matter of light moment, for, as has been already stated in the body of the work, one of the chief advantages to be derived from a residence in a mild climate, is the opportunity, thus afforded, of being much in the open air. And it is in this respect, chiefly, that Torquay has the advantage over Penzance, which is nearest to it of all other places in England in regard to temperature.

The results established by the foregoing tables are manifestly opposed to the prevailing opinions of the humidity of the climate of Torquay; but it is, perhaps, not difficult to explain how impressions, thus proved to be erroneous, have originated. Until within the last

few years, the only place in Devon in which meteorological registers were kept, was Dartmoor, and there the fall of rain is very great. This fall, by a very easy and not unnatural mistake, was regarded as the average of the county; and hence it was universally represented that Devonshire, though possessed of a mild climate, was also exceedingly wet; and it was hastily concluded that Torquay maintained the same watery character. "Everybody," says Dr. Granville, in his 'Spas of England,' "knows that it rains *a very great deal* in Devonshire, and certainly not less at Torquay than in other parts of the coast of that county." To assertions such as these, statistics are the only, as they are also the most incontrovertible, answer; and these I have supplied in the preceding pages.

The comparative dryness, thus demonstrated, is undoubtedly dependent on circumstances of local position. The limestone, on which the town is built, probably has some effect; its position midway between two rivers, the Dart and the Teign, has, in all likelihood, a still greater influence; but I believe the chief cause is the proximity of the high range of the Dartmoor hills. Clouds rest there, and moisture is copiously deposited; when at Torquay, and in the immediate neighbourhood, the sky is clear and the air dry. Be the explanation, however, what it may, the practical fact is now abundantly evident.

Another circumstance also deserves more attention than it has yet received in this Appendix; I mean the

shelter afforded from cold winds. It need scarcely be observed that, during the winter and early spring months, the prevailing winds are from the cold points of the compass,—the east, north-east, north, and north-west. In the year 1847, it blew from these quarters on 171 days; the months of January, February, March, April, November and December, having 96, or considerably more than one half, as their share. And it is also equally clear that such winds are much more trying to invalids at these seasons than during the warm weather of summer and autumn. Now, it is precisely from these winds that Torquay is most effectually sheltered; and the broken nature of the ground extends this shelter to a considerable distance in several directions, so that invalids may enjoy walks, or rides, or drives, over a tolerably extensive country without danger. And this is no small advantage; for the eye soon becomes weary of the same unvaried scene, and when the *pleasure* of exercise is diminished, its *benefit* is also curtailed.

It was stated at the commencement, that the town of Torquay is situated in the cove, in its two diverging valleys, and on the slopes of the adjacent hills. These arrangements have been the result of necessity, rather than of choice. When the low grounds became fully occupied, and the annual influx of visitors still increased, it became requisite to supply a larger amount of accommodation, and, accordingly, the hill-sides were gradually covered with detached villas. And from this

an advantage, probably not at first anticipated, has been secured, in the variety of climate thus afforded within a small space. The greatest amount of warmth and shelter is obtainable below; while fresh, free, and more bracing air can be enjoyed above. I need scarcely say how completely this accords with the wants of consumptive patients; some of whom require everything that will soothe, while others, though equally needing an unirritating air, do best when it is also, to a certain extent, cooler and more invigorating.

Sir James Clark, in speaking of the forms of disease in which the climate of the south-west coast is likely to be beneficial, observes, "In chronic inflammatory affections of the throat, trachea, and bronchi, attended with a dry cough, or with little expectoration, decided benefit may be expected. But when there exists in such cases a congested state of the mucous surfaces with copious expectoration, especially when occurring in a languid and relaxed constitution, the disease is more likely to be aggravated than diminished, by a residence on this coast."[1]

Such a statement as this, from a physician of such eminence, and one who has paid so much attention to the influence of climate on morbid actions, necessarily carries with it great weight. Nevertheless, I am convinced that it requires to be considerably modified. Were the climate of this locality (for the above remarks

[1] Influence of Climate, p. 154.

are reiterated more than once in reference to Torquay,) precisely what it is represented to be in his treatise, there can be no doubt that, judging from theory, such a result might be expected. But we have already seen that the more extended data now in our possession, prove these views to be erroneous, that the climate of Torquay does not possess the extremely humid character which has been ascribed to it. And experience, the only real test after all, is equally conclusive.

In my own practice, far from looking upon copious bronchial secretions as an unfavorable sign, in the fresh cases which every winter brings to us, I am accustomed to regard their presence as an omen for good, and to expect speedy benefit. Instead of finding the expectoration increase, after their arrival here, we usually observe that it diminishes in amount, and with this decrease there is a corresponding improvement in the general symptoms. In the body of the work, I have referred to the case of an elderly gentleman, who has been subject to bronchitic attacks, and whose lungs are emphysematous, with dilated bronchi. When he first came under my care, the tubes were universally filled with muco-purulent secretions, and the expectoration was constant, day and night. He had not been here many days when it diminished rapidly, and in less than a fortnight there was scarcely a wheeze to be heard throughout the chest, and that with scarcely any change in the treatment previously adopted. This is merely an example,—one of many cases.

Nor is my experience, in this matter, different from

that of my colleagues here; and on referring to Dr. Shapter's excellent work, I find that he affirms the same facts. Speaking of phthisis in the second stage, he says, "By a residence in this climate the pulse becomes stronger and less quick, *the expectoration lessened*, the evening fever, and its subsequent night perspiration, diminished, and the patient, to a certain extent, recovers his former strength."[1]

Again, in regard to bronchitis,—"In old persons it assumes a somewhat different character; the expectoration is profuse and constant; the pulse feeble and languid; the bodily, and sometimes mental powers, are characterised by extreme debility, and the disposition to sleep is often so strong, as to give an impression of moroseness. In these chronic forms of bronchitis *this climate appears very beneficial*, relief being afforded in the older and more confirmed cases, and cure in those of earlier life."[2]

The truthfulness of the above observations is further attested by the fact, that, when the bronchial mucous membrane is abnormally dry and irritable, we often find the greatest benefit (especially during the prevalence of east or north-east winds,) from keeping a kettle constantly on the fire, a long tube being attached to the spout, so as to convey the steam into the room. Such a measure as this could scarcely be necessary, if the air were naturally, and at all times, such as has been commonly believed,—viz., overpoweringly soft and relaxing.

[1] The Climate of Devon. p. 126.
[2] Ibid., p. 128.

My experience, however, completely bears out the assertion of Sir James Clark, that cases of pure atonic dyspepsia, connected, as they most commonly are, with general debility, will be injured rather than improved by a residence in this climate. And I am inclined to think that the same remark applies, in a somewhat modified degree, to those cases of phthisis in which the primary steps of the digestive process are impeded, by a like condition of the stomach. I have rarely seen them do well; there may be some amelioration of the pectoral symptoms for a time,—indeed, there generally is; but the disease is not permanently arrested, and the defective assimilation continues to manifest itself, in the steady progress of decay.

On the other hand, Torquay is well adapted for the residence of those who suffer from the nervous or the irritable forms of dyspepsia, either existing alone, or as parts of phthisical disease. And the same is true of those cases in which there is a tendency to tubercular, or to simple peritonitis. Very striking examples of the great and permanent benefit thus derived, have occurred, both in my own practice, and in that of my friend and partner, Dr. Battersby.

It is also worthy of remark that, in phthisical cases, in which there has been suppression of the catamenia, that discharge has often become re-established, during the residence of the patients in this place, more especially while they have been using the Cod-liver oil.

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