

Practical suggestions for the prevention of consumption / by G. Calvert Holland.

Contributors

Holland, G. C. 1801-1865.
Royal College of Physicians of Edinburgh

Publication/Creation

London : W.S. Orr, 1850.

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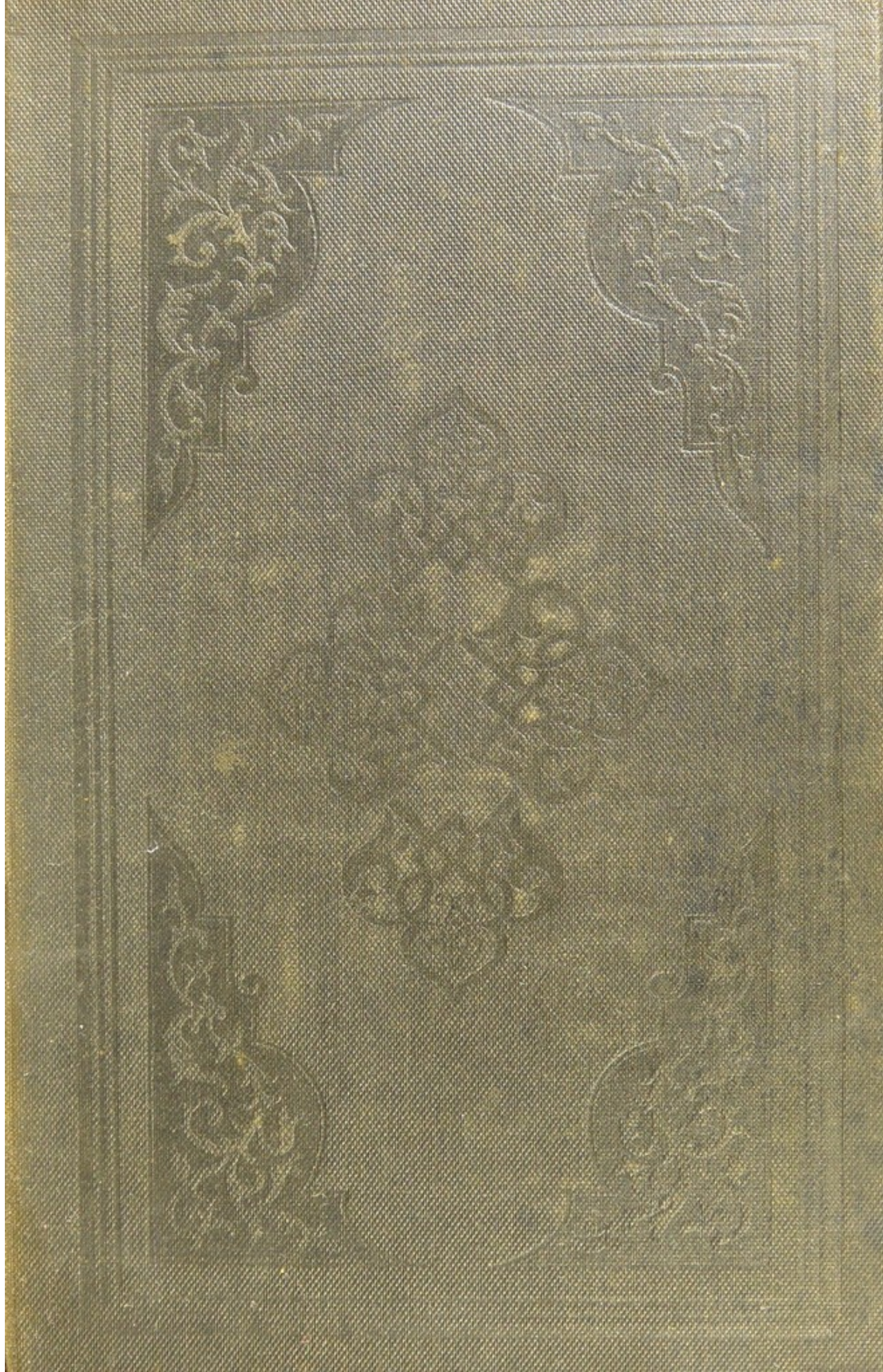
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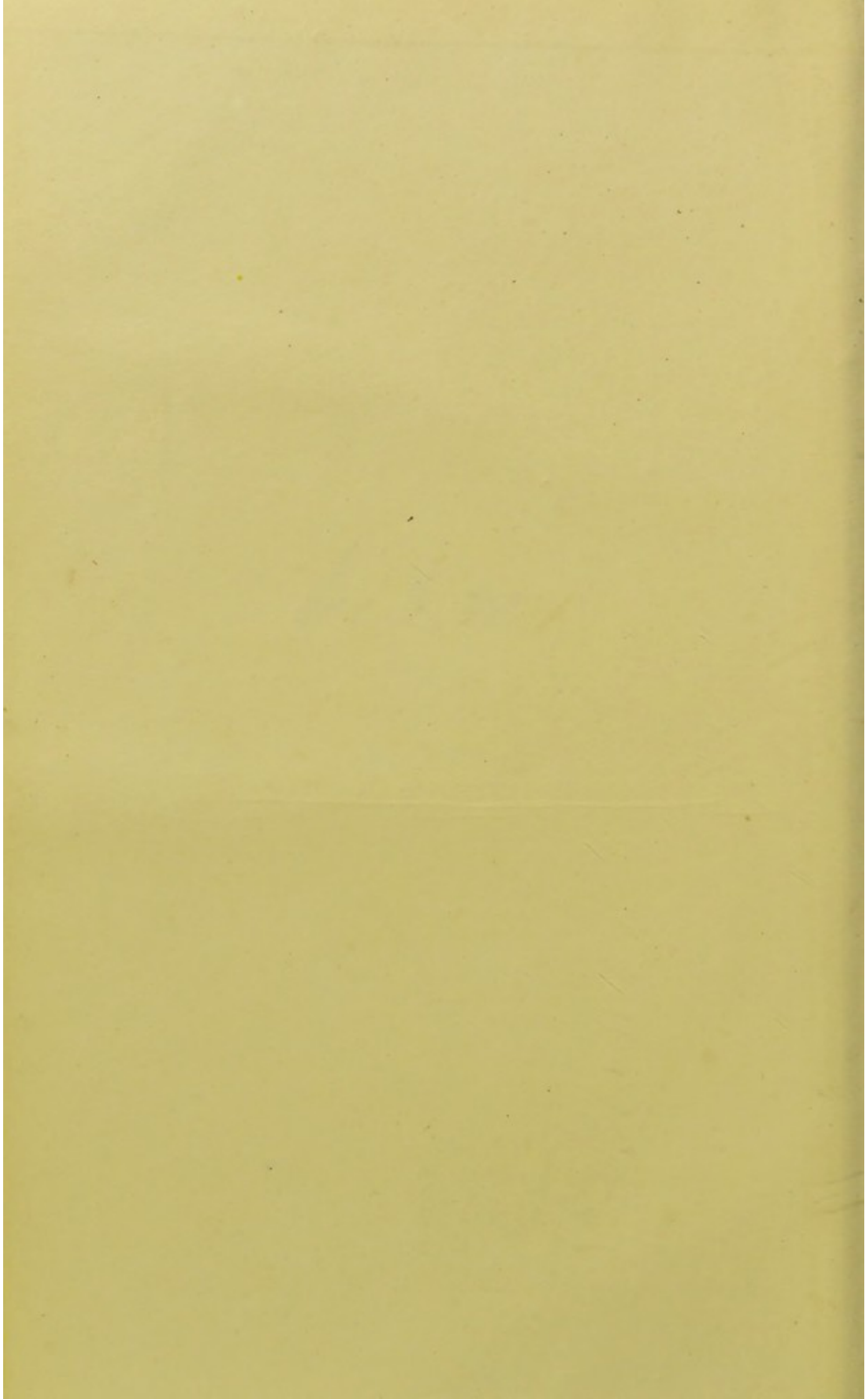
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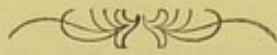
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MEDICAL WORKS

BY

G. CALVERT HOLLAND, M.D.



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CITY OF BOSTON
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BY
JOHN H. COOPER, JR.

Medical Works

BY

G. CALVERT HOLLAND, M.D.

LATELY PHYSICIAN TO THE SHEFFIELD GENERAL INFIRMARY, BACHELIER
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PREVENTION OF CONSUMPTION

Practical Suggestions

FOR THE

PREVENTION OF CONSUMPTION.

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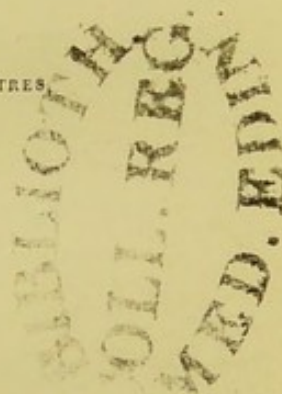
FOR THE

PREVENTION OF CONSUMPTION.

BY

G. CALVERT HOLLAND, M.D.,

LATELY PHYSICIAN TO THE SHEFFIELD GENERAL INFIRMARY, BACHELIER ES-LETTRES
OF THE UNIVERSITY OF PARIS, FORMERLY PRESIDENT OF THE ROYAL
PHYSICAL AND HENTERIAN SOCIETIES, EDINBURGH.



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TO

SIR JAMES CLARK, BART., M.D., F.R.S.

DEAR SIR,

THERE IS NO ONE TO WHOM
I CAN MORE APPROPRIATELY DEDICATE THIS SMALL TREATISE,
THAN TO YOU.
YOUR RESEARCHES INTO THE
ORIGIN AND NATURE OF CONSUMPTION
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THAN BY THE EXERCISE OF VIRTUES WHICH
DO HONOUR TO THE MAN.

BELIEVE ME,

YOUR OBLIGED AND FAITHFUL FRIEND,

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*47, Welbeck Street,
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SIR JAMES CLARKE BART., M.D. F.R.S.

1844

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Your obedient servant,

J. G. WILKINSON

Secretary to the Board of Directors

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25, Abchurch Lane, London, E.C. 4

14th June 1844

I am, Sir, very respectfully,

Your obedient servant,

J. G. WILKINSON

Secretary to the Board of Directors

of the Bank of England

14th June 1844

J. G. WILKINSON

P R E F A C E.

IN introducing this small Treatise to the notice of the reader, I may be allowed to remark, that it has not been written with the hope to interest or with the intention to enlighten the medical profession; but to convey information on matters intimately connected with health to the public at large.

Extensive professional experience, and circumstances which have particularly directed my attention to the investigation and treatment of consumption, have often suggested to my mind the practical advantages of a work of this description. Of course its value will depend on the manner in which it is executed. My object has been to give sound physiological knowledge bearing on the various subjects discussed. It is probable that some of the principles developed, as well as the correctness of the application of them to the prevention of disease, may be questioned by those who are regarded as authorities on such matters. A difference of opinion does not necessarily affect their truthfulness. Every independent inquiry into the functions of life is open to objections. Sometimes its scope and aim are not clearly apprehended; or the conclusions to which it

leads are not traced through the successive steps by which they have been established with sufficient accuracy to form a just estimate of them.

The physiological principles laid down in reference to measures proposed to prevent consumption, and to give tone and vigour to the animal economy in cases of functional, as well as in many diseases characterised by structural changes, have been carefully and elaborately considered. The efficacy of the measures does not rest, however, on theoretical views alone, but on extensive experience—on results which are full and satisfactory. Experience, nevertheless, if not guided by just and enlarged views of the powers of life, is always limited in the resources which it would otherwise have at its command.

In the literary composition of the work, I have studied to render it acceptable to those to whom it is addressed. They are to be interested as well as instructed, and hence technical terms, where it was possible, have been strictly avoided, and illustrations of vital phenomena derived occasionally from other branches of science, have been given in the hope to accomplish these ends, which would not have been introduced had the treatise been intended for the professional reader.

CONTENTS.

CHAPTER I.

THE CHARACTER OF THE CONSUMPTIVE PREDISPOSITION.

| | PAGE |
|--|------|
| Definition of the term predisposition..... | 17 |
| Circumstances which lead to the suspicion of the existence of the consumptive tendency | 18 |
| Conditions of the body which characterise the predisposition..... | 19 |
| Variety of symptoms which indicate the consumptive tendency..... | 20 |
| Persons of the consumptive habit readily affected by active remedial treatment..... | 21 |
| Frequent derangement of the air-passages and lungs in those predisposed to phthisis..... | 22 |
| Frequent disorder of the uterine system in the consumptive habit..... | — |
| Precocity and activity of the mental powers in those predisposed to the disease..... | — |

CHAPTER II.

THE NATURE OF THE OBJECTS TO BE ATTAINED BY THE EMPLOYMENT OF PREVENTIVE MEASURES.

| | |
|---|----|
| General state of the animal system in those predisposed to consumption..... | 24 |
| Consumptive constitution one of debility..... | 25 |
| Remarks on diet in reference to the consumptive habit..... | 26 |
| Duties annexed to the conditions of health..... | 27 |
| Advantages of mental and corporeal exercise..... | — |
| Circumstances out of which <i>specific</i> disease arises | 28 |
| Several species of bodily exercise..... | 29 |
| Superiority of foot-exercise | — |
| Beneficial effects of the use of dumb-bells..... | 30 |
| Advantages of friction..... | 31 |
| Injurious results from the frequent drugging of the system..... | — |

CHAPTER III.

THE STRUCTURE AND FUNCTIONS OF THE LUNGS AND
THE RELATIONS OF THESE ORGANS TO THE
REST OF THE ANIMAL ECONOMY.

| | PAGE |
|--|------|
| Description of the heart and its relations to the lungs..... | 33 |
| Structure of the chest..... | 34 |
| Structure and two-fold functions of the lungs..... | 35 |
| Importance of an ample breathing-surface..... | 36 |
| Evils arising from the diminution of the air-cells..... | — |
| Effects of age on the structural conditions of organs..... | 37 |
| Modifications in the capacity of the chest from the two acts of respiration..... | 38 |
| Changes in the circulation and properties of the blood from the two acts of respiration..... | — |
| Different degrees of expiration and inspiration, and the corresponding alterations in the qualities of the blood..... | 39 |
| Contractions of the heart a <i>measure</i> of the changes in the properties of the blood | — |
| Power of man to modify the qualities of the blood..... | 40 |
| Capacity of the chest capable of being permanently enlarged..... | 41 |
| Functions of the lungs affected by certain conditions of the abdominal viscera | 42 |
| Importance of the study of these conditions in the employment of measures either to prevent the development of phthisis, or to arrest its progress | — |
| Value of physiological principles in the consideration of phthisis | 44 |
| Injurious effects of certain positions of the body | — |
| Causes producing indigestion | 46 |
| All parts of the animal system united into one indissoluble whole | 47 |
| Illustrations of the intimate union of the powers of life | 48 |

CHAPTER IV.

THE INFLUENCE OF DIFFERENT KINDS OF EXERCISE ON
THE STRUCTURE AND FUNCTIONS OF THE LUNGS,
AND ON THE ANIMAL SYSTEM AT LARGE.

| | |
|---|----|
| General and specific effects of exercise..... | 50 |
| One general effect of muscular exercise | 51 |
| Muscular efforts send an increased quantity of blood to the chest | 52 |
| Circumstances increasing the beneficial effects of exercise | 53 |

| | PAGE |
|--|------|
| Conditions which imply a deficiency in the vital qualities of the blood | 53 |
| Remarks on the advantages of walking exercise..... | 54 |
| Two important classes of vital actions | 56 |
| Description of the first class engaged in the process of digestion | — |
| Description of the second class whose office it is to remove from the system matters no longer required | — |
| Effects of exercise on these two classes of vital action..... | 57 |
| Advantages of walking exercise to the delicate and consumptive..... | 58 |
| Precautions to be observed after taking active out-door exercise..... | — |
| Character of horse-exercise and its advantages | — |
| Precautions necessary to be observed by the delicate in using horse- exercise | 60 |
| Carriage-exercise a luxurious mode of inhaling fresh air | 61 |
| Carriage-exercise unequal to the necessities of the animal system | 62 |
| Corpulency induced by carriage-exercise..... | 64 |
| Effects of singing and reading aloud on the functions of the lungs..... | — |
| Capacity of the chest permanently increased by both species of exercise | 65 |
| Effects produced on the form of the chest in professional singers | 66 |
| Conditions in which singing and reading aloud may be enforced with advantage | — |
| Professional prejudice against the use of dumb-bells | 67 |
| All remedial measures have their day and fashion..... | 68 |
| Some species of exercise act chiefly from <i>within</i> , outwards,—others from without, <i>inwards</i> | 69 |
| Use of dumb-bells combines the two-fold influence | — |
| Cause of the alleged injurious influence of dumb-bells..... | 70 |
| Rules to be observed in the employment of dumb-bells..... | — |

CHAPTER V.

THE INFLUENCE OF FRICTION ON THE FUNCTIONS OF THE LUNGS AND ON THE ANIMAL SYSTEM GENERALLY.

| | |
|---|----|
| Nature of the cutaneous functions | 72 |
| Functions of the skin modified in all diseases and derangements of the system | 73 |
| Importance of the study of the relations between the external and in- ternal surfaces of the body | 74 |
| Why the blood, in diseases generally, has a tendency to leave the ex- ternal surface..... | 75 |
| Application of means, for the correction of disease, suggested by the study of the relations between the two surfaces..... | 76 |
| All nerves endowed with an animating principle..... | 77 |
| Phenomena in favour of the existence of a nervous principle | — |

| | PAGE |
|--|------|
| Every species of bodily exercise and every remedial agent act directly on nervous matter..... | 79 |
| No remedy possesses the same extensive influence as friction on the vital powers | 79 |
| Considerations in reference to the application of means to correct the predisposition to consumption | 80 |
| Effects of friction on the conditions of the lungs and the animal system generally..... | — |
| Changes in the qualities and distribution of the blood from the employment of friction | 81 |
| Friction is not simply a preventive measure of consumption but may be used with great advantage in various stages of the disease | 83 |
| Consumption not a disease of the lungs alone, and hence the advantages of friction | — |
| Cause of the general derangement of the animal system during the progress of consumption | — |
| Effects of friction on the distribution of the blood | 84 |
| Mode in which nature acts in the restoration of health in all morbid conditions | 85 |
| Advantages of friction in the diseased states of the lungs characterising consumption | 86 |
| Advantages of friction in the scrofulous constitution | 87 |

CHAPTER VI.

CONSIDERATIONS ON DIET AND ON THE PROPER MANAGEMENT OF THE DIGESTIVE ORGANS.

| | |
|--|----|
| Difficulties of the subject | 88 |
| Peculiarities of the digestive organs | — |
| Food to be nutritious must be conjoined with other conditions essential to health..... | 89 |
| Health frequently exacts sacrifices of ease and indulgence | 90 |
| Diet must have a reference to the vicissitudes of climate and other causes | 91 |
| Conditions necessary to secure perfect digestion | — |
| Remarks on animal food and other articles of diet..... | — |
| Prejudicial effects of tea | — |
| Roast meats to be preferred to boiled..... | 92 |
| Articles of diet have a <i>specific</i> action on the stomach | 93 |
| Evils arising from overtaking the different organs of the system..... | — |
| Food to be nutritious must often be stimulating in its nature..... | — |
| No exact rules can be laid down on the subject of diet..... | 94 |
| Steak or mutton-chop one of the most nutritious articles of food..... | — |

| | PAGE |
|---|------|
| Mode in which a beef-steak may be cooked with advantage. Note..... | 94 |
| Necessity of moderation in diet | 95 |
| Beneficial effects of comparative inactivity of mind and body after a substantial repast | 96 |
| Influence of stimulants on the animal economy..... | — |
| Good things in moderation always good..... | — |
| Remarks on wine and malt-liquor | 97 |
| Two general properties of wine and malt-liquor..... | 98 |
| Functions of the nervous system, and an analysis of the action of the stimulating property of wine and malt-liquor | — |
| Depression does not necessarily follow from the action of stimulants... | 99 |
| Conditions of the body in which stimulants are beneficial | 100 |
| The nutritive property of stimulants | 101 |
| Evils which frequently arise from the withdrawal of stimulants..... | 102 |
| Injurious effects of purgatives | 103 |
| Occasional cause of constipation..... | 104 |

CHAPTER VII.

REMARKS ON CLOTHING.

| | |
|--|-----|
| Character of the climate of this country | 107 |
| Influence of the seasons on the surface of the body and on the powers of life generally..... | 108 |
| Influence of the seasons on vegetable life | 109 |
| Importance of attention to the conditions of the surface of the body under different circumstances | 110 |
| Remarks on dress..... | 112 |
| Beneficial use of flannel | 113 |
| Injurious effects of corsets | 114 |
| Precautions necessary to guard against baneful effects arising from sudden transitions of temperature | 115 |

CHAPTER VIII.

CONDITIONS WHICH CONSTITUTE A HEALTHY SLEEPING APARTMENT.

| | |
|--|-----|
| Prejudicial effects of unnecessary furniture in a sleeping apartment ... | 118 |
| Similitude between the plant and the human body in sleep..... | 119 |
| Effects arising from the impure atmosphere of a sleeping apartment... | — |

| | PAGE |
|--|------|
| Functions of the cutaneous surface..... | 120 |
| Character of bed best calculated to secure the healthy conditions of the skin | 121 |
| Objections to curtains attached to beds..... | 122 |
| Importance of light to a bed-room..... | 124 |
| Illustration of the influence of light from the Daguerreotype process | 125 |
| Diseases of the lower animals from a deficiency of air, light and exercise | — |
| Importance of maintaining in winter an agreeable degree of temperature in a sleeping apartment..... | 126 |
| Remarks on ventilation..... | 127 |
| Description of Sheringham's ventilator | 128 |
| Advantages of the instrument..... | 129 |
| Measures to secure a healthy condition of a bed-room in summer..... | 131 |
| Efforts necessary to obtain health | 133 |

CHAPTER IX.

CONSIDERATIONS IN REFERENCE TO THE FEMALE CONSTITUTION.

| | |
|---|-----|
| Importance of functions peculiar to the female..... | 134 |
| Efficacy of friction in the correction of the disordered conditions of the uterus | 135 |
| Relations between the spinal cord and the internal organs..... | 136 |
| Efficacy of friction conjoined with the shower-bath | 137 |
| Importance of attention to the uterine functions where the consumptive predisposition prevails | 138 |
| Remarks of a philosopher on the practical advantages of friction..... | 140 |
| Efficacy of friction in the case of Lord Teignmouth | — |

Practical Hygiene
Part II
PREVENTION OF CONSUMPTION.

CHAPTER I.
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PRACTICAL SUGGESTIONS
FOR THE
PREVENTION OF CONSUMPTION.

CHAPTER I.

THE CHARACTER OF THE CONSUMPTIVE PREDISPOSITION
AND ITS FREQUENT MANIFESTATIONS.

1. BY the term predisposition is understood such a condition of the body, or such a conformation of certain parts of it, as, under particular circumstances, gives rise to a specific disease or class of diseases. Thus a predominance of the nervous system, creates a susceptibility to nervous affections;—of the lymphatic, to scrofulous morbid changes;—of the circulatory,—characterised by a fulness of the energies of life,—a tendency to inflammatory attacks; and lastly, a peculiar delicacy of the vital powers generally, not unfrequently associated with the imperfect development of the chest,—a proneness to phthisis.

The consideration of these peculiarities would open out an important field of inquiry, and one indeed of great practical value; but the prosecution of it would withdraw the attention from the immediate object of

the present remarks : viz., the analysis of the consumptive predisposition.

II. It is not easy to trace accurately the conditions of the system on which this predisposition depends. In most cases they are well marked and cannot be mistaken : in others, however, they are at times so faintly perceived, or in other words, the conformation and appearance of the body present such striking indications of health, that it is difficult to detect the constitutional tendency to phthisis.

To the eye of the intelligent professional inquirer such cases are rare ; and as these remarks are addressed exclusively to the general reader, it does not fall within the scope of this investigation to analyse distinctions, which might possibly be regarded as refined speculations, and could be appreciated only by the scientific few.

III. Parents, independently of any just knowledge of those circumstances which distinguish the consumptive habit, have frequently an apprehension of its existence in their offspring from a variety of causes. Some branches of the family have probably died of the disease ; or there may be occasional symptoms which awaken their suspicion : or this may arise from certain measures recommended from time to time by the medical attendant. It is often remarked, 'that coming events cast their shadows before,' and this is peculiarly applicable to consumption. It is foreshadowed by a variety of conditions. To point out some of these is the object of the present inquiry.

IV. The form of the body, in those predisposed to the disease, usually offers certain well-defined characteristics. In infancy and early childhood, they are not very clearly marked, but with the gradual development of the system they become more or less evident. As a general rule, the frame is seldom symmetrically formed. There is a want of harmony in its different parts. A high authority on this subject observes, that "the head is often large, the trunk small, the abdomen tumid, and the limbs unshapely, being either large and clumsy, or disproportionately slender, with large joints."* Such conditions are almost invariably found associated in those decidedly predisposed to consumption. The least constant of these characteristics, is the large head, and those which are rarely absent, in those cases which exhibit a less distinctive tendency to the disease, are the relatively long and slender limbs, the large joints, the unshapely predominance of the osseous over the muscular system, the contracted chest, and in the female a defective development of the mammæ.

V. Other symptoms which frequently indicate the consumptive predisposition, are inflammatory affections of the eyelids and nose, especially in childhood, and the more advanced stages of youth; and the glands of the neck, as well as the tonsils, at this, and at a later period of life, are often enlarged, and are sources of anxiety and inconvenience. This condition of the tonsils, and the relaxed uvula,

* Sir James Clark, M.D., Bart.—The Cyclopædia of Practical Medicine, Part xxii. p. 271.

are symptoms which will rarely be found absent on the occurrence of derangement of the digestive organs, or of the constitution generally.

In childhood, the mesenteric glands are frequently extensively disordered, as shown by the hard and tumid abdomen, the softness of the muscular tissue,—the pasty expression of the countenance, and its occasionally swollen or puffy appearance—phenomena manifesting imperfect nutrition.

VI. Where the consumptive tendency exists, the stomach and the bowels, at every period of life, present a variety of symptoms which accurately mark the prevailing state of the animal system. The appetite is often fastidious and difficult to please, the digestive powers are weak, and are readily disturbed by mental and bodily exertion,—by the perturbation of the mind,—sensual excesses,—slight indiscretions in diet, and other causes. The appetite, in some cases, is almost voracious, but this is only an occasional symptom; but when it exists, the food does not, as in the robust constitution, give evidence of its invigorating influence, certainly not in the ratio of the quantity taken. The fact has led to a vulgar but expressive remark, ‘that it is put into an ill skin.’ The bowels are frequently irregular in their action. The prevailing condition is a tendency to constipation, especially in the female, from her comparatively sedentary habits, and her less generous mode of living, as compared with the other sex. But in both, the bowels are easily acted upon by medicine,—an effect which is often marked with considerable depression of the system. Atmospheric

influences, agitation of mind, undue exertion of the body, and whatever disorders the functions of the stomach, are apt to give rise to diarrhœa. In some, an habitual tendency to relaxation of the bowels prevails.

VII. Other constitutional symptoms have a reference to the muscular system. It is rarely well developed; and though the individuals often possess considerable activity, they are seldom equal to long-sustained efforts of bodily exertion; and if carried a little beyond their strength, they do not immediately recover from the prostration induced. There is no indication of the consumptive predisposition more constant, than the want of power to undergo fatigue with comparative ease, and this applies to the mind as well as the body. There is not only a deficiency of muscular tone, but of general vital energy. The resources of the system are exceedingly limited, and hence are quickly exhausted by whatever makes an inordinate demand upon them.

VIII. It will naturally be inferred from these remarks, that this class of persons will be seriously affected by active remedial treatment, whether employed to subdue inflammation or any other disease. Bleeding, whether general or local, purgatives, blisters, and remedies which depress the powers of life, seldom fail to produce great prostration. This far exceeds what would be anticipated from the measures prescribed. In place of recovering, as individuals more favourably organized would, from the disease and treatment (supposing the former to yield readily to the means) in the course of a few

days, it is often weeks before the system is restored to its usual health.

ix. Other symptoms characteristic of the consumptive tendency, meriting attention, are the frequent affections of the air-passages and lungs. A slight cold, as it would be designated in the robust constitution, gives rise, where this tendency exists, to a variety of morbid phenomena, such as a short and hacking cough, tightness, or severe pains in the chest, a soreness of the throat, enlarged tonsils, fever, and general disturbance of the system. These symptoms, varying only in degree, occur frequently, and are usually little thought of on the restoration to apparent health. They are always worthy of consideration. They are more than the shadows of impending events. *They form an integral part of the evils which will ultimately manifest themselves.*

x. In the female, predisposed to phthisis, the uterine system requires an especial notice. Its functions are mostly tardy in their development, and when they are established, they are subject to great irregularities both as to time and other circumstances. The interruption, or derangement of these functions, even when unaccompanied by any morbid indications, should always be watched with more than ordinary anxiety. This disturbance of influential and natural vital actions, is either an effect of pulmonary disease, or of that state of the constitution out of which it directly arises: or it becomes a powerful cause in the production of the local and general conditions of phthisis.

xi. Writers, in treating of the consumptive pre-

disposition, regard as one of the occasional indications of it—a precocity of the mental powers,—a quickness of apprehension, great activity of mind, and an abounding flow of the animal spirits. Such are unquestionably the characteristics of a very large class.

It is not extraordinary that such mental endowments should be the frequent accompaniments of the consumptive constitution. In this the nervous system is often relatively largely developed, and proportionately active; and the results which flow from these conditions, in reference to the mind and body,—frequently displayed in a liveliness of the passions and a proneness to their indulgence, are among the accelerating causes of the disease.

CHAPTER II.

THE NATURE OF THE OBJECTS TO BE ATTAINED BY
THE EMPLOYMENT OF PREVENTIVE MEASURES.

XII. FROM the foregoing brief and imperfect sketch of the general characteristics of the consumptive predisposition, the reader is prepared to enter into the analysis of the various means calculated to correct what is irregular in the action of the vital powers, or to strengthen what is weak.

The first important matter which demands especial attention, in the consideration of the tendency to phthisis, is the state of the animal system. The disease, though attacking particularly the lungs, and apparently originating in these organs, is, nevertheless, to be regarded as constitutional, or in other words, is to be traced to the prevailing condition of the body, whether natural or induced. The predisposition to the disease is to be studied less in reference to the lungs, than to the predominant state of the animal economy. It may, as a general rule, be fearlessly asserted, *that the pulmonary affection can arise only from the feeble or disturbed action of the vital powers at large*, and hence the value of all measures which can be shown to influence these beneficially. The public have much to learn on this subject. Their

views, in relation to disease, or disordered functions, are not only necessarily limited and imperfect, but they almost exclusively fix the attention on particular organs, losing sight altogether of the bodily conditions out of which they generally spring, or by acting upon which existing local derangements may be removed.

In the examination of no disease, whether in the attempt to discover its origin, nature, or appropriate treatment, are such considerations of more importance, than with respect to phthisis: and we would strongly urge on those whom we address, the unquestionable practical bearing of the remarks which pervade these pages in elucidation and confirmation of this truth.

XIII. The consumptive constitution is invariably one of debility—of deficient vital energy. Certain organs only may appear to exhibit this weakness; it is, however, the characteristic condition of the entire animal economy. The general conformation of the body—the pale, or sickly sallow complexion—the want of firmness in the muscular tissue—the frequent dyspeptic symptoms—the irregular action of the bowels—the acute susceptibility of atmospheric and other changes—the inability to bear fatigue—the liability to inflammatory affections of the mucous membrane of the eyes and nose, of the air-passages and lungs, unequivocally establish the fact. Contemplating the constitution in these points of view, various considerations naturally suggest themselves to the mind as correctives of such a state of the animal system.

XIV. The first of these considerations is diet, in its most comprehensive sense, including the whole class of ingesta, that is, solids and liquids, whether regarded as essentials or luxuries.

It is desirable that the food should be as nutritious as is compatible with the ability of the stomach to elaborate it, as on the amount and quality of that which results from the process of digestion, depends the energy, the tone, and the vigour of the animal economy. If it be deficient in quantity, or in the necessary nutritious and stimulating qualities, it is clear that the powers of life are unfavourably circumstanced for the exercise of their different offices. The want of attention to this, in numerous instances, materially aggravates the existing predisposition to disease. It is not sufficient to satisfy the cravings of the appetite: the study should be to gratify its demands with such articles of diet, that while they are easy of digestion, they are peculiarly fitted to excite and strengthen the functions of the stomach and bowels, and, as a necessary consequence, to invigorate the system.

It may often, we are fully aware, be urged in extenuation of a course of conduct widely opposed to the one here recommended, and particularly in the female sex, that the appetite is fastidious—has its frequent loathings of food of a substantial kind, and that digestion is weak. While we admit the force of these objections, it must at the same time be remarked, and the observation rests on considerable experience, that these symptoms, indicative of a deficiency of vital energy in the digestive apparatus,

and in the system generally, are largely to be ascribed to the prejudicial habits of the individual.

There are imperative duties inseparably annexed to the conditions of health, which are often neglected. This may be given almost to superfluity, but the continuance of it requires that there shall be no infringement of the laws which co-operate in the production of this,—the greatest of blessings. If attention to these duties be indispensable, under the most favourable circumstances—where the constitution possesses an exuberance of vital energy—how much more urgent is their claim on the consideration of those, who are much more delicately formed, whose bodily powers are finely balanced, and, of course, proportionately susceptible of disturbance. Man is not like the plant that flourishes in its fixed locality, to which heaven imparts the stirring breeze, the refreshing rain, and the awakening light—elements essential to its growth and vigour. He must go in search of those conditions on which health depends. They are not to be found in the close or ill-ventilated apartment—in the enervating indulgence of the passions,—in the inactivity of mind and body—in a narrow and unchequered sphere of exertion, but in the free and energetic play of the various organs with which he is marvellously endowed.

xv. One of the most important of the conditions essential to the production and maintenance of health, is exercise both of the corporeal and mental powers. Alternate activity and repose are their natural states, and whatever disturbs their sound adjustment lays the foundation for disease. The undue

predominance of either is prejudicial to life. They lead to different results, but they are equally detrimental in their influence.

Health can be attained only by properly regulated bodily exercise. It is imperatively necessary to keep the complicated living machine in action. Without it, or when inadequately carried out, the current of life stagnates in its channels, as deficient in its stimulating elements as of motion. The mental faculties lose their vigour—they are no longer equal to their ordinary efforts—vitiating in their perceptions, the world without becomes sickly and morbid in its aspects. Discontent, and self-created misery and wretchedness, follow in the train. The appetite fails, or it becomes fastidiously nice in its requirements; the stomach gives unequivocal intimations of weakness—it struggles ineffectually to perform its duties, and is constantly conveying the unwelcome indications of its embarrassments. The rest of the digestive organs are equally disordered. The liver becomes inactive, or the secretion which it pours out is wanting in its essential qualities. The bowels refuse to act with their accustomed regularity, and from their distension, and other co-existing conditions of derangement, the whole animal economy sympathises in this general disturbance of the powers of life.

Out of this state of things *specific* disease arises. It may be the gradual disorganization of the lungs, assuming the form of phthisis;—mania, or a variety of nervous affections,—acute or chronic inflammation of the several viscera;—inveterate cutaneous eruptions,—the cessation of important functions,—fevers, and a

long list of incurable evils. *The character of the disease is determined by the existing predisposition, either natural or induced.*

This is no exaggerated picture of the disorders which are to be traced to the neglect of exercise. They are the inevitable consequences of the infringement of the laws annexed to the conditions of health. It is, therefore, evident in the consideration of the preventive measures of consumption, as well as of every other disease, that the vigorous action of the limbs, and of the entire body, in the open air, is indispensably necessary to secure the sound play of the organs of life.

There are several kinds of exercise, as on foot, on horseback, in the carriage, as well as other modes of influencing, either partially or generally, different parts of the body. Of these, exercise on foot has strong claims to attention. It develops and invigorates the whole muscular system. It promotes the equable distribution of the blood, transmitting it in undue proportion to no particular region. The surface of the body gives evidence of its salutary effects in the improved complexion,—in the clear and healthy condition of the skin. A grateful stimulus is imparted to the various secretory organs and to every fibre of the animal economy.

This species of exercise has strong claims on the consideration of those who possess the consumptive tendency, as we shall hereafter endeavour to explain. When kept within judicious bounds—graduated to the ability of the individual to indulge in it,—producing neither immediate nor subsequent fatigue or

depression, it gently accelerates the circulation and excites the healthy action of the lungs.

We are not treating of exercise in reference to its influence on the robust constitution, but in relation to those, who, from the delicacy of their organization, are predisposed to phthisis. The means to be enforced must be regulated according to existing circumstances. Where the powers of life are finely balanced, and consequently peculiarly susceptible of derangement, the measures to be employed must be adjusted with a strict regard to these conditions. The object of these remarks is to show in what way disease originates, and the mode in which it may be counteracted by properly regulated diet and exercise. They are studied here in their general bearing on the constitution. We shall afterwards analyse their effects more in detail in reference to the lungs.

XVI. In the consideration of preventive measures, we have to treat not only of those which give tone and energy to the vital powers at large; but, also, of such as are calculated, from their local action, to influence directly the form and capacity of the thorax, and, at the same time, the functions of the pulmonary organs. The chest in the consumptive is generally imperfectly developed. There is a want of ample space for the free play of the lungs, and this is one, and a frequent cause of their susceptibility to disease. The constant use of the dumb-bells is invaluable in all such cases. It exerts a beneficial influence which cannot be too highly estimated. Singing or reading aloud, produces also its salutary effects on the functions of the lungs. It causes the expansion of these

organs, giving entrance to a larger quantity of air and blood, and proportionately facilitates the interchange of important chemical elements, thereby fitting the vital fluid for the correct performance of its extensive duties. Such exercise, judiciously carried out, has a tendency to remove the frequent congestion of the lungs, arising from listless and inactive habits,—from the bent position of the body, which usually accompanies sedentary pursuits, and likewise from a vitiated atmosphere.

XVII. Another remedial agent, in its efficacy equal to any of the foregoing, IS FRICTION WITH THE FLESH-BRUSH ON THE ENTIRE SURFACE OF THE BODY. Its physiological influence, in the variety of its relations to the powers of life, has not been elaborately studied by any previous writer. Our views on this subject are fully discussed in two recent publications,* and in the following pages we shall again bring them under consideration.

XVIII. In these general observations on the preventive measures of consumption, it would be an unpardonable oversight not to draw attention to THE ABUSE OF THE FREQUENT DRUGGING OF THE SYSTEM. The evils arising from this practice are incalculable, and in the majority of those cases in which it is adopted to correct the disordered stomach, the constipated bowels, the occasional nervous affections, and

* THE NATURE AND CURE OF CONSUMPTION, INDIGESTION, SCROFULA, AND NERVOUS AFFECTIONS. 1850. CASES ILLUSTRATIVE OF THE CURE OF CONSUMPTION AND INDIGESTION. 1850. London: W. S. Orr, and Co., Amen Corner, Paternoster Row.

the feeling of languor and debility, diet and exercise, judiciously regulated, and other means, would be equal to the removal of the urgent symptoms. The practice is incompatible with the conditions of health. It is positively injurious to the powers of life—to the delicately organized structures of the body; and it creates a dependence in the numerous organs on adventitious aid, until at last they will discharge their duties only when assisted. They are like the mass of mankind—they easily acquire bad habits. Give them crutches to rest upon—let all their demands be at once responded to, they will do little for themselves. They must be induced by general invigorating measures—by placing them under the influence of new circumstances, to carry on their important functions independently of the co-operation of drugs.

It is melancholy to contemplate the consequences flowing from the frequent recourse to these, especially in the delicate constitution. If those who so readily swallow them—now a draught—then a mixture, and its accompanying pills—had a just idea of the structure of the organs on which these act—of the nature of the effects which they produce,—of the disturbance, local and general, which they occasion in the vital powers, they would take them at much greater intervals and in much less quantity.

CHAPTER III.

THE STRUCTURE AND FUNCTIONS OF THE LUNGS AND
THE RELATIONS OF THESE ORGANS TO THE REST OF THE
ANIMAL ECONOMY.

XIX. WE shall briefly endeavour to convey, in such terms as cannot fail to be intelligible, a general idea of the structure and office of the lungs,—the mode in which they are liable to be disordered,—the nature of the derangement, and the character of the vital associations which they form with the rest of the animal economy. The subjects are easy of explanation, and it is important that they should be clearly understood, otherwise it will be impossible to appreciate the efficacy of the preventive measures brought under consideration.

XX. The chest, by means of a membrane which is called the mediastinum, is formed into two distinct halves. One contains the right lung,—the other the left and the heart. The windpipe, through its bifurcations and minute subdivisions, brings each in direct connexion with the atmospheric air. The heart has its four cavities—two auricles and two ventricles. The auricle and ventricle which receive the blood from the venous system—blood which is unfitted for the purposes of life until it has undergone certain changes

in the lungs,—are designated the right auricle and ventricle, and their office is to transmit, by successive contractions, such impure blood into the pulmonary organs. The other auricle and ventricle are named left, and into these the blood, after its necessary modifications in the lungs, is conveyed, in order to be transmitted by their successive contractions throughout the animal system. The right cavities have no connexion with the left. They have different relations to the lungs. The four may be regarded as constituting a double heart each having its independent functions.

XXI. The framework of the chest is formed of three classes of bones: the dorsal portion of the spine—the breast-bone or sternum, and the ribs. The ribs are twenty-four in number, fourteen of which,—seven on each side,—by means of cartilage are inserted into the sternum. The remaining five are called *false*, having no such articulation. This bony structure is further strengthened by a variety of muscles both on the anterior and posterior parts of the thorax, the exercise of which modifies the capacity of the chest and proportionately the functions of the lungs.

The chest is divided from the abdomen by a muscle, which is designated the diaphragm, the action of which it is important to note in connexion with respiration, both in the healthy and diseased conditions of the body. The chest is described as forming a *cone*, or rather *conoid* in its shape, the summit being above and the base below.

XXII. The lungs and the heart are organs contained within this cavity, to which we shall particularly

allude. Their structure, office, and relations to each other and the rest of the animal economy, should be fully understood. The lungs are exquisitely adapted to the functions which they have to perform, which are twofold. FIRST THEY HAVE TO RECEIVE AN IMMENSE QUANTITY OF BLOOD, AND SECONDLY, A LARGE AMOUNT OF AIR, to modify its qualities—to impart to it essential vital conditions: and further, without interrupting the reciprocal interchange of elements between the two, they must contain a quantity of air to be expended in speaking, singing, and other articulate actions. Nature has beautifully organized the lungs for these purposes. They are formed of minute cells, the *aggregate* surface of which if accurately estimated, would astonish by its magnitude. Small as the cells are, and fine as the membranous partitions are by which they are separated from each other, these have distributed on their surface incalculable capillaries,—that is minute vessels, one class containing *venous* blood—blood that has to part with carbonic acid and to acquire oxygen; and the other class carrying the blood so purified to the left side of the heart, to be sent by the contractions of the left ventricle to every region of the body. The air, derived from without, enters these numberless cells to supply the oxygen and nitrogen which are required: and a large portion of the contained air of the lungs, having received the carbonic acid from the blood,—which is deleterious to animal life,—is expelled to make room for a corresponding amount of fresh air, which after parting with its vital elements, is similarly emitted.

It is by such an adaptation of means to ends that nature secures the correct performance of these important processes. A LARGE BREATHING SURFACE IS AN IMPERATIVE CONDITION, to spread out the blood in imperceptible currents or strings of globules, every molecule of which has to be brought in contact with the inspired air—has to lose and gain a something essential to the mysterious actions of life. How necessary it is that this aggregate surface of the air-cells shall not be abridged by any obliteration or diminution of them,—by injurious positions of the body,—by sedentary pursuits, disease and other causes.

Let those who have no just conception of the value of the integrity of such service, consider the effects which inevitably arise from the collection of small particles of dust on the upper surface of the leaves of a plant. This gradually becomes sickly and perishes. Why does it become diseased and die? Because such particles interrupt the interchange between the gaseous elements of the atmosphere and those of the sap circulating on the upper surface of such leaves. These cannot get quit of that which they have to part with, nor can they acquire that which is necessary to their health.

An obliteration or diminution of the air-cells of the lungs is invariably followed by similar constitutional results. These in their incipient stage may not be detected by any symptoms—by any indications of bodily derangement; they are, however, a loss of a portion of that capital on which the well-being of the system depends. A rich man may not feel the

loss of a fraction of his fortune, but a successive dissipation of such fractions will ultimately affect his position: and it is thus with the abridgment of the air-breathing surface. Nature does not give greater capacity or vigour of action to any organ than what is essentially necessary to robust health. The body has no loose or unemployed capital to spare from its ordinary duties; and, therefore, any permanent diminution of a function, consequent on structural modifications, whether of the lungs or of any other vital organ, is an evil which seldom remains stationary in its degree. It does not stand alone independent of surrounding living matter. It has definite and extensive relations with the whole animal system.

Age in its natural progress is accompanied with an imperceptible change in the conditions of all tissues. First, one class of vessels ceases to act or only feebly performs its duties,—then another follows in the march of decay; and contemporaneous with these alterations, the nerves—the media of motion and sensibility,—the channels through which flow the energies of life, falter in the exercise of their functions.

We have stepped aside to make these remarks, as illustrative of the importance of maintaining the integrity of the lungs,—or, in other words, of the aggregate surface of the air-cells; and the power of man in accomplishing this—of correcting congenital imperfections—is far greater than is generally imagined. Every organ is capable of additional development without bordering on disease.

We have briefly endeavoured to explain the general structure and office of the lungs, and are now prepared

to enter a little deeper into the consideration of the action of these organs. The capacity of the chest is modified by respiration in two ways. On the reception of every fresh portion of air, which is *inspiration*, it is increased in all directions. The diaphragm, which separates the cavity of the thorax from the abdomen, descends towards the latter cavity, or in more scientific terms, it presents a concave surface to the lungs, and a convex one to the abdomen,—a change which manifestly enlarges the cavity of the chest, and proportionately facilitates the free play of the pulmonary organs. On the expulsion of air, which is *expiration*, the chest is correspondingly contracted, so that the reception and emission of air are aided by these two respiratory acts.

XXIII. The next important inquiry is, in what manner are the circulation and the properties of the blood in the lungs influenced by these respective actions. This is a consideration of great moment and worthy of attention, as the understanding of it is necessary to the appreciation of those measures which will be urged as calculated to correct a tendency to consumption. *Inspiration facilitates the flow of blood through the lungs,—expiration retards it*; but the exercise of neither function disturbs the action of the air upon the blood, because the lungs always contain a large quantity of air independently of that which is immediately expelled and received, which is far more than equal to the momentary demands of the vital current.

There are various degrees of inspiration and ex-

piration, and the changes in the motion and properties of the blood in the lungs, are in the ratio of these two acts. These may be only just perceptible, as in the softest breathing; or they may be aroused to a greater extent, as in speaking, singing, and by lively emotions; or they may be further increased by violent muscular exertions. It is important to bear in mind,—and the fact cannot be too strongly impressed,—that the changes in the qualities of the blood, or in other words, its fitness for the purposes of life, is always in direct relation to these two functions of respiration, and to all bodily exercise. It is as much in our power to improve the condition of the blood,—to promote its healthy circulation, and at the same time to impart greater capacity and vigour to the numerous organs of the body, as it is to perform any voluntary act. We will endeavour to bring these facts within the most ordinary apprehension.

The adult body is supposed to contain about thirty pounds of blood, and the heart to transmit at each contraction, two ounces. If the heart, therefore, contracts seventy-five times per minute, the whole mass will perform its revolution once every three minutes; and this degree of circulation will be an accurate measure of the chemical changes which the blood undergoes in the lungs. If from exhilarating emotions, manifested by various external signs, as in animated discourse, in the boisterous laugh, in the restless movements of the body, or indeed by any species of active exercise, the contractions of the heart are increased to one hundred, in place of seventy-five,—the average in the unexcited

state of the system,—it is evident that the entire mass of the blood will pass through the lungs in one-fourth less time, and hence it follows, as an inevitable consequence, THAT ITS CHEMICAL OR VITAL CHANGES IN THE LUNGS WILL BE AUGMENTED IN SUCH RATIO.

It is, therefore, clear that it is in the power of man to invigorate the life-carrying current—to confer upon it properties essential to the maintenance of health; and let it be kept steadfastly in mind that every derangement in the condition of this current, whether from depressing passions, sensual excesses, sedentary pursuits, an idle and luxurious life, or from general inactivity of body, conveys the seeds of disease to all parts of the animal economy.

In speaking of the frequency of the contractions of the heart being a measure of the chemical modifications of the blood in the lungs, it is necessary to correct a misconception which will naturally arise from this broad statement of the doctrine. *Frequency* is only one condition,—another which is inseparably connected with it in the foregoing reasoning, is the *strength* or fulness of these contractions, which is at once indicated by the character of the pulse. The two conditions are always associated when the heart is influenced by lively mental feelings or exercise accelerating the motion of the blood.*

* The connexion between respiration and the changes of the blood, will be found treated at great length, and illustrated by numerous experiments, in a Work of mine, published in 1829, entitled "AN EXPERIMENTAL INQUIRY INTO THE LAWS WHICH REGULATE THE PHENOMENA OF ORGANIC AND ANIMAL LIFE." Mr. Julius Jeffreys, F.R.S., and the manufacturer of the Respirator, took the liberty of borrowing—I hope to return

The pulse is often quicker than natural in those who are delicate, and who lead a sedentary or inactive life ; but then, as a general rule, it is small and feeble, unequivocally proving that the blood is not undergoing the same extent of chemical changes in the lungs, that it would were the pulse the same in number, but fuller and stronger. The volume of waters, and its rate of motion, are elements necessary to determine the quantity which flows in a given time ; and the same data are required in reference to the blood and its vital modifications in the lungs.

XXIV. The different degrees of inspiration and expiration excite a variety of muscles to contraction, which are brought into play by every species of bodily exercise. Their frequent and vigorous action has the power of permanently *enlarging* the capacity of the chest, and to an extent far exceeding what would be thought possible.

The bony structure of this cavity is moulded in its form and regulated in its development, in an extraordinary degree, by the predominating contractions of numerous muscles. This increase in the capacity of the chest *is accompanied with a proportionate increase in the volume of the lungs*. They are elastic and conform to all the changes of the thorax, so that when those muscular efforts are enforced, which have a tendency to augment its capacity, they at the same time multiply the aggregate breathing

with thanks—the views developed by me on this subject, without the slightest acknowledgment, as may be seen on reference to his treatise, “Views upon the Statics of the Human Chest, etc.” 1843. There are few more extraordinary pieces of plagiarism on record.

surface of the air-cells, facilitating the pulmonary circulation, and presenting favourable circumstances for the changes of the blood, — changes indispensably necessary to counteract the predisposition to consumption.

xxv. We will now endeavour to point out in what way the functions of the lungs are liable to be affected by alterations in the condition of the abdominal viscera, — by certain positions of the body, — by the absence of a due degree of muscular exertion, as well as the relations between these organs and the rest of the animal economy. The consideration of these matters has an intimate connexion with the study of the preventive measures of consumption. We have spoken of the importance of securing uninterrupted free play to the lungs; it, therefore, necessarily follows, that whatever abridges the proper action of these organs, limiting the space for their exercise, will be proportionally prejudicial to their functions and to the whole of the powers of life. An enlargement of the liver or general distension of the bowels from flatulence, — conditions which are often observed to precede the manifestation of consumptive symptoms, as well as to be coexistent with them, are circumstances which exert a baneful influence on the lungs; they produce an obvious physical effect. From pressing from below, upwards, against the diaphragm, which divides the cavity of the chest from the abdomen, they diminish the capacity of the former, in consequence of which the delicate pulmonary tissue loses, to a certain extent, its light and elastic structure. Many of the minute air-cells

are virtually obliterated. They become impervious to the inspired air, which is not only injurious, from the subtraction of a portion of the breathing capacity of the lungs, but from the local congestion which it occasions—that is an undue accumulation of blood in the parts affected,—which may be regarded as *laying the foundation of those conditions which generate the consumptive germ.* This can scarcely be imagined to exist independently of congestion. It may further be remarked, explanatory of the production of this condition and of its prejudicial tendency, that the blood, under such circumstances, does not possess its ordinary healthy properties, and hence is the stagnation of this fluid deficient in its essential vital qualities acting on tissues predisposed to disease.

The whole of the preventive measures have a relation to these views, the practical importance of which can scarcely be over-estimated. They have for their object the correction or prevention of a vitiated state of the blood,—of existing local congestion, and a dispassionate analysis of these measures will establish their claim to consideration.

We are satisfied from extensive observation, that the derangement of the abdominal viscera, and the unnatural distension of the abdominal cavity, are among the frequent exciting causes of consumption; and, when this disease exists, that they materially aggravate its symptoms and accelerate its progress. They not only produce the physical effect alluded to—a diminution in the capacity of the chest,—a condition incompatible with the proper exercise of the lungs, but they are sources of irritation, and necessarily

prevent the due elaboration of food, how light or simple soever it may be. They are, therefore, causes which develop, in an important degree, the consumptive predisposition, and in a corresponding ratio feed the disease when it exists.

The consideration of these principles in all their relations to the powers of life, has been suggestive of measures in the treatment of consumption which had not previously occurred to the mind. Our attention has not been confined to the investigation of the pulmonary affection, but has also been directed to the study of the various causes which aggravate it, among which the derangement of the abdominal viscera, in whatever form it may display itself, whether manifested by distension, tenderness, or by any structural or functional indications, demands our particular examination.

The contemplation of these principles presenting in a comprehensive, and at the same time in a definite form, the character and relations of the vital powers, has brought strongly home the conviction, that the correction of the morbid conditions will rarely be satisfactorily accomplished by *internal* remedies alone. They are to be reached beneficially, and in such a way as to give tone and vigour to the constitution generally, by acting from *without, inwards*. We have the whole surface of the body on which to operate, abounding in nerves and blood-vessels, every one of which is a part of an uninterrupted chain extending to the minutest molecule of organized matter. Sound is not more regularly transmitted through space, by the successive impulses communicated to the air, than does an impres-

sion made on the surface of the body, modifying its vital conditions, awaken an influence which affects the intermediate particles reaching to the remotest fibre.

Just views on curative as well as preventive measures can alone be based on these general physiological principles. Health is the result of the correct action of every organ. Disease is the derangement of the entire system, varying only in the degree of its manifestations in different localities and tissues; and to treat it with success,—promptly and safely, and at the least expense to the vital energies,—the remedies must not have a relation to one region only of the body, exhibiting the morbid deviations, but more or less to the whole of those powers, which in the aggregate constitute life, according to the extent of their disturbance.

XXVI. It is clear from the foregoing observations on the functions of the lungs, and the effects arising from a diminution of the capacity of the chest—effects obviously incompatible with health,—that certain frequent or habitual positions of the body must be extremely prejudicial, and are worthy of consideration in reference to the consumptive predisposition. The occupations of both sexes, whether followed as the serious duties or the amusements of life, often imply not only general inactivity, but an unfavourable position of the body—the trunk is bent forward, as in writing, drawing, and many kinds of needlework,—circumstances which are invariably fraught with baneful consequences. The position forces the abdominal viscera against the diaphragm, thereby preventing its full

descent, which is essential to the admission of a proper amount of air into the lungs, as well as for the free circulation and changes of the blood in these organs.

The injurious effects arising from these conditions, are the occasion of a variety of diseases. The blood deficient in its vital properties, and languid in its motion from the absence of exercise, has always a tendency to accumulate in the internal organs generally. The lungs, the liver, the bowels, and other viscera, receive more than their due proportion, and blood, it must be remembered, that is deteriorated in its qualities. Hence from these causes arise many affections of the chest, as consumption, shortness and difficulty of breathing, palpitation of the heart, and many uncomfortable as well as painful sensations, which are to be traced to obstructed pulmonary circulation.

Indigestion, in all its forms, has frequently the same origin. The appetite is impaired—the stomach is not in a condition to elaborate the food it receives, and hence numerous dyspeptic symptoms, directly referrible to the stomach, the liver, or the bowels; or from the derangement of these several organs, the mental faculties, the nerves, and the muscular system are variously modified in their functions.

Wherever there is a delicacy of constitution, or a tendency to phthisis, it is important that every position of the body which interferes with the free action of the lungs, should be carefully guarded against. It is one of the frequent predisposing and exciting causes of the disease.

XXVII. Without a clear conception of the nature of the relations existing between the lungs and the rest of the animal economy, it is impossible to appreciate the beneficial influence of different remedial measures, which in their action may be regarded as preventive of consumption, or as tending to correct the constitutional predisposition to the affection.

All parts of the animal system are united into one comprehensive whole, *by means of nerves and blood-vessels*. It matters little to the reasoning which follows, whether the nerves are derived from this or that nervous centre, and according to their origin designated cerebral, spinal, or ganglionic; or whether the vessels arise immediately from the trunk of the great arteries, or from their remote and minute subdivisions, they are links of one uninterrupted vital chain. We cannot excite to increased action any portion of the nervous system, whatever may be the character of its functions, without, in a proportionate degree, *affecting every organic molecule of the body*. We cannot trace the exact effect produced, it is, nevertheless, inevitable. Every vital action is at the expense of nervous power and of blood. The loss of both is the result of every such action, and to continue this, it is necessary that the nervous and sanguineous systems shall co-operate to this end. If the process be digestion, these systems are called upon in an especial manner to contribute their resources towards the accomplishment of the function. The same may be said of every other process of the body. There is nothing mysterious in the nature of the co-operation which is thus readily furnished. As every vital action is

accompanied with the loss of nervous energy and of blood, such action is kept up by the required current being supplied from both systems. To illustrate the force of this reasoning, we may remark, that the streamlet which issues from a mass of waters, influences the motion of every particle of it. The constant flow is maintained by that portion of water the nearest to the point of escape, but that portion, how limited soever it may be, cannot receive this direction without a change taking place in the entire mass. The effect is not appreciable by our senses, but it is indisputable. The streamlet which sets in motion any given quantity of this mass of waters, modifies the condition of every successive quantity extending throughout the whole.

Such is the general relation between every vital action and the nervous energy and blood. The action which exists, or which may be excited, may be regarded in the light of the streamlet in reference to the mass of waters. It is a change in the condition of these two powers *directly* co-operating in such process, and consequently a change in the condition of the whole of these powers from which the process derives the necessary supply. Now comes the practical application of this doctrine. If we employ friction, either with the hand or the flesh-brush, over the whole or any large portion of the body, *we stimulate the whole or part to increased action*; or, in other words, we bring to the surface an additional quantity of blood, and proportionately modify the amount of nervous energy distributed to the region on which we act. We cannot produce this

result without improving the condition of every organ. The blood is drawn from parts which previously possessed it, and, therefore, it is evident that an influence, and important in its degree, has been exerted on every molecule of living matter. Similar effects arise from every species of exercise.

If those whom we particularly address could appreciate, at their full value, these physiological truths,—could feel that to call into healthy play the muscles of the body, is to impart new life, tone, and energy to every fibre, they would readily acknowledge that man has within his power, resources if properly directed, equal to the correction as well as the prevention of numerous diseases.

CHAPTER IV.

THE INFLUENCE OF DIFFERENT KINDS OF EXERCISE ON
THE STRUCTURE AND FUNCTIONS OF THE LUNGS,
AND ON THE ANIMAL SYSTEM AT LARGE.

XXVIII. THE foregoing remarks have prepared the way for entering on the consideration of the effects which arise from the several species of exercise. Each possesses a general and a specific influence. That which is general characterises all actions to which the term exercise is applied. Each necessarily brings into play different muscles, and according to the number and magnitude of those acted upon, and the degree of their contraction, *is the extent of the effect produced upon the nervous and sanguineous systems.*

One obvious result is the acceleration of the motion of the blood in the exact ratio of the particular exercise. There are generally other accompanying phenomena ; such as the sensation of increased warmth—the augmented production of heat—the more animated or glowing expression of the countenance—changes depending on the degree of the muscular efforts. We will endeavour to show how these efforts modify the condition of the vital powers.

The subject is to be studied in two points of view :

firstly, the direct effect of muscular contraction on the parts excited to action : and, secondly, the indirect influence exerted on the functions of the lungs by bodily movements.

When a series of muscles is aroused to contraction, one consequence must necessarily follow : viz., the *increased* flow of blood and nervous energy to such muscles. Their action requires an augmented supply of both, proportionate to the temporary expenditure of these powers. It is a law of the system that they shall flow in such direction. If the exercise be frequently repeated, or be connected with the daily occupation of the individual, the muscles become permanently enlarged,—they acquire prominence, hardness, and additional strength, simply because they have been highly nourished by the ample stream of blood and nervous energy transmitted to them. The contemplation of muscular action in extreme cases, furnishes an illustration of the changes which take place in all degrees of bodily exercise.

We have attempted to show that the whole of the system is so indissolubly associated, that it is impossible to affect the conditions of one part without modifying the vital relations of the rest. This is strikingly exemplified in regard to bodily exercise. We cannot bring into play any large class of muscles as in walking, running, dancing, or in the various vigorous motions of the arms, but we must influence the distribution and properties of the blood throughout the animal system. This arises from several circumstances worthy of consideration. The blood cannot flow to any region in an increased stream, without every other

region from which it is drawn feeling the effect, which gradually augments with the continuance of the exercise until the circulation in every organic fibre assumes new vital relations.

These changes do not take place, as in a series of inert tubes filled with water, where the escape of one portion or a new direction given to it, immediately alters the condition of the mass. The muscular exertion acts directly on the nervous system,—a system which binds together all parts of the body, and the impression which is made upon it, communicates by what is designated sympathy, a stimulus to every molecule of matter.

XXIX. All muscular efforts send an increased quantity of blood to the chest, the effect of which is to excite the lungs and heart to more frequent action. The respiration is accelerated, and at intervals, its two acts, *inspiration* and *expiration*, are much deeper and stronger than under ordinary circumstances. Without such change in the character of the breathing, the blood could not pass with the required facility through the lungs.

To meet the exigency, arising from active exercise, the heart is aroused to vigorous contractions, and consequently transmits, at each contraction, a larger stream, with an augmented impetus, throughout the body—a stream possessing at the same time improved vital properties.

XXX. We have previously stated that muscular exertion has a *direct* influence on the motions of the chest, and consequently on the functions of the lungs. In the foregoing remarks we have alluded to the *indirect*

effects produced on these organs, which as they necessitate increased respiration, it is somewhat difficult to separate the direct from the indirect results. It must also be admitted that the indirect are the chief causes of the altered character of the respiration. Most kinds of exercise, when taken for the pleasure which they afford, and especially in the society of others, create exhilarating feelings, which in their varied modes of expression exert a marked influence on the functions of respiration. Hence exercise in the company of others—from the cheerful stimulus which is imparted to the mind,—gently arousing its faculties,—is far more beneficial than when indulged in alone. In this case we only extract half the good which it is capable of conferring. A solitary walk is almost like dining alone. The exercise and the food may be both excellent, and well calculated to nourish and strengthen the body, but they want the co-operation of agreeably excited emotions to give them the full advantage of their salutary influence.

XXXI. We must now say a few words on the nature of the changes produced in the blood by exercise. It is unnecessary to remark that health depends on the healthy condition of this fluid. The fact is too obvious to need illustration. It may possibly be said that it is difficult to determine when the blood is in this state. We may lay down this general rule as a guide to solve the question. *Whenever the amount of active exercise taken is unequal to the necessities of the system,* as manifested by a variety of symptoms, such as a feeble or

impaired appetite, imperfect digestion, and its numerous consequences,—cold extremities, and the absence of a natural degree of heat; as well as many indications of the derangement of the lungs and heart, existing independently of structural disease,—we may rest assured that the blood is deficient in its essential properties.

We cannot accelerate the motion of the blood by any species of healthy exercise, without this fluid acquiring, at the same time, additional vital qualities. It becomes richer in all those elements necessary to nourish and invigorate the powers of life. The improved current which is thus transmitted throughout the system, imparts new energies to all organs, enabling these, if previously struggling or embarrassed in their efforts, to remove the obstacles to their free and ample play.

The phenomena which are here brought under consideration are effects common to all kinds of exercise, varying only according to the circumstances stated. The next point to which we direct attention, is the specific influence which belongs to the several species of exercise, investigating it in reference to the delicate or consumptive constitution.

XXXII. Walking is the most beneficial of all kinds of exercise. When taken in moderation, it is the most grateful stimulus to the whole of the vital powers, and for the degree of its activity, is followed by the least amount of fatigue. Its direct action is upon the muscles of the lower extremities, of the loins, of the back, of the abdomen, and of the chest, aided by the movements of the arms. The

muscles of the lower extremities—and in a lesser degree those of other parts become firm, hard, and are occasionally largely developed by it.

Such exercise, from the extent of the muscular system which it directly influences, is peculiarly calculated to facilitate the natural operations of all the internal organs. It gently agitates the abdominal viscera, promotes the secretion of bile, and of the various fluids co-operating in the functions of digestion. It excites the secretion of urine, and secures the regular action of the bowels. The organs of the chest are also equally affected. The respiration is quickened—its two acts, inspiration and expiration, are not only more frequent, but are fuller and stronger than when the body is in a state of repose.

A larger amount of air, in a given time, enters the lungs, causing their more ample expansion, and in a corresponding ratio are the vital properties of the blood increased. The heart contracts with greater force, and transmits an augmented current, fraught with the elements of life, to all parts of the animal system. The effects are obvious in the agreeable warmth which is created,—in the animated glow of the countenance—in the moist state of the skin, or the tendency to copious perspiration.

XXXIII. Mankind are often at great pains to gratify and pamper the appetite. They are fastidious in their choice of food ;—or they are comparatively indifferent in their taste, eating and drinking with little discrimination. In both cases, there is seldom a due attention given to the consideration of those circumstances essential to perfect digestion, and

the healthy condition of the body. There are two great classes of important vital actions: one includes certain internal organs, whose office it is to break down the food,—to extract from it the nutritious elements which it possesses, and so to mix and elaborate these as to fit them to mingle with the blood in the lungs, in which situation, from coming in contact with the air, they are converted into arterial blood. The organs which perform these duties, are those which co-operate in digestion—the sole end of their functions being the production of chyle,—the fluid resulting from their conjoint action, which is conveyed from the bowels by a distinct vessel to be transmitted into the lungs to form *new* blood.

There are matters arising from these different operations which must be thrown out of the system, as well as various elements in the blood, which must also be emitted in their due combinations and quantity to secure health. The other great class comprehends those organs which may be regarded as media for the escape of these, in which number are the kidneys, the lower portion of the bowels, the lungs, and the whole surface of the body. The functions which these perform are quite as important as those of the first class, and if embarrassed, or unequal to their duties, the animal system is necessarily disordered. Its well-being depends on the accuracy of the balance maintained by these two classes of vital actions. And it may be asserted, without any reservation, that disease largely originates in the disturbed functions of these subsidiary organs — organs removing a variety of elements resulting from the operations

of the other class engaged in furnishing the required nutriment according to the gradual waste.

When the system is little excited by exercise—when comparative inactivity is the rule, and exercise the exception, the kidneys—the bowels—the lungs, and the entire surface of the body, as *excretory* organs, are inevitably disordered. The secretion of the kidneys is either defective in quantity or quality; the bowels are torpid, and the evacuations are unhealthy; the lungs are not in a condition to allow of the escape of gases and vapour, except in the ratio of their diminished action, and the cutaneous surface is similarly circumstanced.

Exercise on foot is peculiarly calculated to excite the natural functions of these organs. It determines the blood in an accelerated and improved vital current to all of them, and hence facilitates the escape of matters, which, if partially retained, would be prejudicial to life.

Let those who never contemplated the particular effects flowing from exercise, consider the mode in which it influences the vital powers. Let them constantly keep in mind that among its various results, is the direct relief which it is affording to the system, by allowing the emission of elements which have become useless from the activity of its operations. And let their view be further enlarged by considering that such emission, in its due degree, is indispensably necessary to the proper action of every fibre of the body,—that health is an impossibility without it, and that disease is the certain consequence of a disregard of those conditions which promote it.

XXXIV. To those predisposed to consumption, moderate exercise on foot has peculiar advantages. It excites no violent commotion in any part of the system. It gently arouses the functions of the lungs—expands them for the reception of a greater quantity of air and blood, and facilitates the circulation of the latter through these organs; and by conferring upon the lungs a greater capability of action, lessens the liability to the occurrence of congestion, which may be regarded *as the foundation of those structural changes which constitute pulmonary consumption*. It is one of the initial conditions of the disease.

It is not easy to lay down exact rules as to the amount of exercise which shall be taken to be salutary in its influence. The scale will be modified according to the character of the constitution. One general rule, however, may be stated as a guide. It should never be enforced to the extent of inducing fatigue. Every degree which borders upon this will be prejudicial.

The ability to bear exercise augments with the frequency of its repetition, which is the best evidence of its beneficial effects. If it has heated the system, care is required afterwards on the part of the delicate to guard against injurious consequences. The susceptibility to atmospheric and other influences is greatly increased; and, therefore, it is important to avoid everything which is likely to chill the surface, as an apartment which is either damp or cold, and the putting on clothes which have not been properly aired.

XXXV. Horse exercise comes next under con-

sideration. To the robust it is unequalled for its invigorating effects. To those who are perfectly at home in their seat, a degree of independence, animation and lightness of spirits is experienced, which belongs to no other species of muscular motion. It gives the eye a command of a variety of objects which would otherwise not be perceived,—it furnishes occupation and pleasure in the management of the animal, in the study of its temper, and in the regulation of its paces, thus agreeably blending bodily and mental activity.

If the rider and the horse are moved by the same spirit,—the one ardent in the chase, and the other stimulated by the struggling efforts of his fellows and the bustle and life of the field, it is then exercise vigorous and healthy in the highest degree. It brings into play the largest amount of the nervous system, in association with exhilarating feelings, and it is the combination of the two which chiefly constitutes its salutary influence.

This kind of exercise agitates principally the trunk and abdomen. It imparts little or no motion to the lower extremities, and hence these are often imperfectly developed, compared with the rest of the frame, in those who spend a great part of their time on horseback. We have evidence that these parts are inadequately acted upon, from frequently becoming cold and benumbed, when the weather is chilly, though, with the exception of these, an agreeable warmth is diffused throughout the system.

The blood is accelerated in its motion, and flows abundantly to the cavities of the chest and abdomen,

stimulating the organs of both to greatly increased action. It promotes all the secretions, and from the full and frequent expansion of the lungs, which it occasions, it proportionately augments the chemical changes of the vital fluid. Where there is a tendency to corpulency, or where the constitution is phlegmatic,—that is, where the powers of life require more than ordinary stimulating to raise them to the pitch of vigorous health, or to enable them to perform efficiently their functions, horse exercise is superior to all other kinds of bodily activity.

Our business, however, is not to lay down rules for the guidance of such individuals. Its duties lie within a narrower sphere. It is to consider what is beneficial to the delicate, or those predisposed to consumption. That which gives to this species of exercise its strong claim to the attention of the robust, renders it prejudicial to, or demands nice management on the part of those who are less favourably organized. By the feebly constituted it should be indulged in with moderation, otherwise it exhausts in place of invigorating the system. It determines to the lungs a large amount of blood. It awakens these organs to the highest state of activity, and hence, from their susceptibility of external impressions, they are liable to be injuriously affected, from the *sudden* cessation of that motion which has produced this condition; and further from the system being occasionally exposed to a chilling atmospheric influence. The blood, under these circumstances, has a difficulty in re-establishing that balance of circulation which characterises comparative bodily repose, and consequently the disturb-

ance in its distribution may become the foundation of pulmonary or other diseases.

It may be laid down as a rule, which is applicable to all kinds of exercise, in reference to those predisposed to consumption, that whenever the vital powers have been strongly aroused, whether in the open air or within doors, it is imperatively necessary that these powers be allowed to subside into their natural state by slow and imperceptible gradations.

If interfered with, during the effort to resume those conditions which characterise the inactivity of the body, as frequently occurs in the abrupt transition from a warm to a cold atmosphere, or in the changes of dress,—these powers, highly susceptible of external influences, are liable to serious derangement. The blood is suddenly repelled from the surface, and is thrown upon some of the internal organs, producing congestion or inflammation in the lungs or other important viscera.

This change in the distribution of the blood may be regarded as one of the first obvious steps in almost all diseases, but invariably coexisting with a corresponding disordered condition of the nerves locally implicated, or of the nervous system generally. To the disturbance of the functions of nervous matter all abnormal vital actions are to be traced. All structural or other modifications are the inevitable consequences of it. It is the primary seat of all morbid affections.

XXXVI. Carriage exercise may be defined a luxurious mode of inhaling fresh air. It is accomplished independently of bodily exertion, and independently

of that degree of bodily motion which is essential to health. It is certainly not without its advantages. It is far better than the close or well-ventilated apartment; but it is not exercise that can be recommended as calculated to invigorate the system,—to develop its muscular powers,—to give additional capacity to the chest,—to promote in the required degree the more free and ample play of the lungs; or, indeed, to produce those effects in the system generally, which constitute robust health. A two miles walk is far more salutary in its influence than a twenty miles drive. The latter, from the constrained positions of the body, wearies and fatigues, so that it becomes a luxury to stretch and use the limbs.

Nature has richly endowed man with a variety of organic instruments, the proper exercise of which conduces to the pleasures and well-being of existence. The law which she has superadded to these instruments, is, *that health can result only from their due activity*. The organs of loco-motion were given to be used, and they are structurally and functionally so connected with every fibre of the body, that their vigorous movements may be regarded as the safety-valves of the system, as well as the inlets of new life and energy. An infringement of the law—the law of health, is premature old age, decay, and disease.

Carriage exercise has a tendency to induce corpulency, and hence it may be imagined to prove its salutary influence. In this, however, there is a great

mistake. The accretion of fat beyond what is necessary to the development of the exquisite proportions and beauty of the human form, as a broad principle, is not evidence of a vigorous state of the powers of life. It shows that they are sufficiently healthy to create and deposit such organic materials. But were they in a higher state of health, as characterised by the activity of the nervous and sanguineous systems, imparting ease and facility of motion, giving hardness and firmness to the muscles, and a tone of endurance to the body, such a condition would only occur as an exception to a general rule. We readily admit that in some individuals there is a strong predisposition to corpulency, and that no circumstances can correct it. Why does it frequently manifest itself after the prime of manhood? Clearly not because the powers of life possess at this, than at any earlier period, a greater amount of vital energy. Why does luxurious ease promote it? Because it does not call into play that variety of bodily actions which prevent the production, in an undue proportion, of the elements of one kind of organic matter; or if created, give them a direction, and establish relations among them more conducive to the well-being of the animal economy.

We object not to carriage exercise as one means of health. It is fraught with some good, but in a limited degree. It should not be regarded as equivalent in its results to the more active movements of the body. It will not produce those modifications in the condition of the vital functions

which are essential to give tone and vigour to the system generally, or to correct a predisposition to consumption.

XXXVII. We now come to the consideration of another and an important class of vital operations, exercising an extensive influence on the functions of the lungs. We allude to singing and reading aloud. Objections have frequently been advanced against the practice of both, where the delicacy of the constitution indicated a tendency to phthisis, but certainly on no satisfactory grounds. Those who have urged them have not taken the pains to investigate the structural or functional conditions which create a tendency to this disease; or, at least, have not studied, with the attention they deserve, those measures which are calculated to correct such predisposition, tracing the precise structural and functional effects which naturally flow from them. They have not elaborately examined the influence of these measures in a philosophical spirit. Because the lungs were delicately organized, or imagined to be, they have often recommended the comparative repose, rather than the active exercise of them, as if rest were favourable to the establishment of the vigorous functions of organs, weak, but not diseased. One law applies universally to all living structures. The extent and the soundness of their vital operations, *cæteris paribus*, WILL BE IN THE RATIO OF THEIR ACTIVITY. The withdrawal of this is invariably accompanied with debility: it narrows the sphere of their capabilities and usefulness.

The present inquiry is probably the first scientific

attempt to analyse the diversified effects springing out of measures, which are here enforced as preventive of consumption, and it is based on physiological principles. It is on these alone that we can take one sure step in the investigation. They must be our guide, and not casual incidents occurring in practice,—injurious results arising from injudicious conduct. These should have their weight—not to arrest the application of means, but to teach the limits within which they should be confined. We must not look upon the subject in detached points of view, or through a medium which distorts the vision, but examine it in all its relations to the powers of life.

XXXVIII. Singing and reading aloud are acts which directly influence the condition of the lungs. They quicken the breathing, causing inspiration and expiration to be more frequent, fuller, and stronger than under ordinary circumstances. We have previously endeavoured to show that the effects which inevitably arise from this character of respiration, are an increased flow of blood to the lungs,—the greater expansion of these organs, and consequently, in a given time, the reception of an augmented quantity of air, and the more perfect chemical changes of the blood.

When either species of exercise becomes a daily practice, the cavity of the chest is *permanently* and considerably enlarged, and hence the capacity of the lungs enabling them to perform their functions with greater regularity and completeness. It is scarcely necessary to observe that this improvement in the condition of the pulmonary organs is felt in

every part of the system. A healthier vital stream is distributed to every fibre of the body.

Every celebrated singer has always an ample chest. It is essential to the display of that talent for which the individual is distinguished, and without it could not exist in an eminent degree. Though the qualities of the voice depend on the peculiar structure of the vocal organs, yet the volume of air which they require to enable them to produce their extraordinary effects can be supplied only by the capacious thorax. Such a development is partly derived from nature, but it is also very largely to be ascribed to the frequently excited action of the lungs and of the different muscles which are brought into play. Changes so obvious and unquestionable in the form and functions of important organs, arising from their vigorous exercise, furnish a striking illustration of the justness of the physiological principles here expounded.

It is not to be imagined from the foregoing reasoning, that either species of exercise is recommended when evident symptoms of consumption have manifested themselves; but in all cases where there is an apprehension of a predisposition to the disease, FROM THE GENERAL DELICACY OF THE CONSTITUTION,—FROM THE CONTRACTED CHEST,—FROM THE SUSCEPTIBILITY OF THE LUNGS AND THEIR ASSOCIATED ORGANS TO DERANGEMENT. These measures are not proposed to cure disease co-existing with a disorganized state of the lungs; but in such conditions of these organs as have a tendency to pass

into this stage,—conditions the nature of which has been explained in a preceding part of this inquiry.

The object of these and other means which are here brought under consideration, is to improve the qualities of the blood,—to promote its more equable and vigorous circulation, and to give greater capacity and freedom of action to the lungs.

Singing and reading aloud are among the most efficient of these preventive measures, and if judiciously enforced will seldom fail to be productive of beneficial results. They are, to a certain extent, a temporary substitute for all other kinds of muscular exertion, and if from the severity of the weather, or other circumstances, it is not desirable or convenient to take exercise in the open air, they should be adopted, not as equivalent to the latter, but as conferring on the system many of its practical advantages.

XXXIX. Professional prejudice has of late years urged strong objections against another species of exercise, which formerly was favourably regarded, viz., the use of dumb-bells. Instances have been brought forward where they are said to have produced injurious effects. A few cases of this kind, arising from the abuse or the injudicious application of a measure, especially when strengthened by the remarks of some medical authority, modify the views, opinions, and practice of the community at large. They see an evil resulting from the use of a certain remedy,—they do not reflect on the causes of its production, nor do they for

one moment set earnestly about analysing the natural properties of the agent which has been employed, or its precise influence on the powers of life. They take an easier mode of condemning it. They adopt the assertions of some one deemed wiser from his position than themselves. They dwell on the evil until it frightens them from its exaggerated and distorted proportions.

These remarks apply to objections not only against the use of dumb-bells, but against all other remedial measures. These have their day and fashion. Their just value is seldom appreciated. Like some of the heavenly bodies they vanish from our sight and re-appear after long intervals.

Did we understand their properties, or accurately apprehend their specific effects, opinion would not thus vacillate and change. It is our ignorance of the merits of what we adopt and discard, that leads to such uncertainty and such unsettled methods of practice.

Every thing has its use, then why not study it in a philosophical spirit? Why not endeavour to ascertain the measure of good with which it is fraught,—the circumstances necessary to evolve it,—and the exact limits where commence its abuse or the inappropriateness of its application? These are not impossibilities. They may be difficulties. Much greater achievements have been accomplished in the various departments of science.

The objections which have been advanced against the use of dumb-bells, might be urged with tenfold greater force against eating. Thousands perish from

over-indulgence of the appetite, and yet eating in moderation is admitted to be really useful. So is exercise of every kind when kept within its due bounds. To determine what these are we must first be familiar with the local and general influence of particular muscular efforts on the animal economy.

XL. We have throughout the foregoing pages endeavoured to prove that to lessen or correct the tendency to consumption, it is necessary as one of several conditions, that the capacity of the lungs shall be *increased*, or that the circulation in them shall be permanently invigorated so that their functions shall be performed with greater accuracy and completeness. All parts of the body participate in these changes, so that the powers of life generally are equally benefited. We have shown that these important modifications of vital action may be produced in very different ways. Some of the causes may chiefly act from *within*, outwards, as singing and reading aloud;—and others, as walking, running and various muscular motions, to a great extent from *without*, inwards. The direct and indirect influence is always, however, more or less associated. The use of the dumb-bells combines this twofold influence in a more equal degree than perhaps any other species of muscular exertion. It brings into play a great variety of muscles belonging to the arms, the thorax, and back, the contractions of which enlarge the capacity of the chest, causing at each effort, an augmented quantity of air to rush into the lungs. These are inevitable results flowing from the exercise, nor are the advantages temporary

where this is habitually employed. All the muscles which are so acted upon acquire additional tone and development. They become hard, firm and prominent. Their frequently excited contractions *draw out the walls of the chest, so that its cavity becomes greatly augmented*, clearly giving greater freedom of action to the lungs, and in a corresponding degree facilitating the correct performance of their functions.

This is a brief exposition of the effects which arise from this kind of exercise. The few cases of injury which have been adduced as arising from its practice, are to be ascribed to two causes: using greater weights than is necessary for the accomplishment of the desired end; or making more violent or longer continued efforts than is consistent with the existing strength, and the comparatively unexercised condition of the different muscles. The weights should be light so as to be handled with perfect ease. The advantages are not in the ratio of the weights, but in the muscular motions to which they give rise, and these may be sufficiently excited by dumb-bells that would almost be playthings in the hands of the child.

The exercise should be gradually carried into practice. It should not be rendered a labour, or be allowed to produce fatigue. It should not be enforced beyond a few minutes each day, for the first fortnight or three weeks, and never continued so as to occasion a sense of exhaustion.

It must be remembered that the various muscles and bones which are thus brought into active exercise, have to be imperceptibly broken in to a wider range of duties. The child makes many

efforts to walk before it acquires a steadiness of step,—all which efforts are a species of instruction to the numerous muscles of the body which co-operate in the act. In the application of remedies we should always endeavour to get as deep an insight as possible into the operations of nature. They should be studied so that we may understand the mode and the means which she employs in the accomplishment of her ends. The transition from the comparative inactivity of organs to their more vigorous exercise, should always be gradual, especially in those who are delicately constituted. If this rule be strictly observed it can scarcely be said that we force nature, but rather that we lure her unconsciously to herself to enter on a larger sphere of vital operations.

There is one remark which is somewhat important in reference to the beneficial influence of dumb-bells. When used by females, there must be no tight corsets about the body, and indeed there should not be at any time. The muscles of the trunk must have every facility of motion otherwise the efforts made to bring them into vigorous play will be of little avail.

CHAPTER V.

THE INFLUENCE OF FRICTION ON THE FUNCTIONS
OF THE LUNGS AND ON THE ANIMAL
SYSTEM GENERALLY.

XLI. WE come now to the consideration of another mode of inducing extensive vital changes in the system, and one that may be employed under a variety of circumstances, in which exercise, in any of its forms, might be prejudicial. We shall, in few words, endeavour to bring within the comprehension of the non-professional inquirer the character of the cutaneous functions, and their relations to the rest of the animal economy. We are not professing to instruct those who are familiar with such physiological researches, but a large class of readers who cannot be supposed to have studied them.

The whole surface of the body is exceedingly vascular,—that is, it abounds in a multitude of small vessels or capillaries, which are constantly receiving from and transmitting to the heart an immense quantity of blood. Of the amount it is difficult to form a just conception. If we imagine that such surface is one uninterrupted net-work of vessels, so exquisitely fine and close in its texture, that it would be injured by the introduction of the most

elaborately pointed needle, a general idea may be gained of the character of its widely pervading vascularity. It possesses not only an abundance of blood-vessels, but a corresponding proportion of nerves. The two always co-exist. There is invariably a strict relation between them.

The more ample the distribution of vessels to any region, the more active the functions which they exercise, and the greater will be the amount of nervous matter in association with them. It is this nervous matter, in scarcely perceptible filaments—embracing every minute artery, that imparts to the mass of vessels, and to every molecule that enters into the constitution of the body, an influence in virtue of which they are enabled to manifest their various properties. IT IS THE ANIMATING POWER OF THE SYSTEM, AND THROUGH THE MEDIUM OF IT, ALL CHANGES IN THE FUNCTIONS OF LIFE ARE PRODUCED, WHETHER THEY BE THOSE OF HEALTH OR DISEASE.

XLII. The operations which are carried on throughout the surface of the body, are co-extensive with this distribution of nerves and blood-vessels. They may be regarded as the safety-valves of the animal system. They facilitate during every moment of existence the escape of vapour and gases, which if partially retained would be prejudicial to the vital powers. In all diseases these operations are variously modified, and in many the disturbance of them is the occasion of severe constitutional derangement: it is both a cause and an effect of the aggravated forms of morbid action.

It is, therefore, obvious that the conditions of the cutaneous surface demand our special attention. It is the seat of important vital functions indissolubly associated with those of every organ, whatever may be its office. They are all links of one uninterrupted chain of living matter animated by one common principle. It is this intimate and widely pervading connexion that gives us the power of acting energetically on the whole, through the media of its several parts, to correct disease—to strengthen what is weak, and to impart tone and vigour to the constitution.

XLIII. It is necessary that the relations between the surface of the body and the internal organs generally should be understood, so that the mind shall be in a position to appreciate the application of measures which modify these relations. There are two considerations which will present these in an obvious and striking point of view. The first is, that, at any one moment, *there is only a certain quantity of blood in the body*. In a vigorous state of health, this is equably distributed to all organs, internal as well as external. But whenever the vital powers are weak, or suffering from occasional derangement, the accurately adjusted balance of the circulation is disturbed, and the blood, under such circumstances, has always a tendency to leave the surface of the body and to accumulate in the internal viscera: it may be the liver, the spleen, the stomach, the bowels, or the lungs; or the blood, which is often the case, may be thrown in different proportions upon the whole of them.

This modification in the direction of a portion of the vital current may not immediately give rise to disease, or to any unequivocal morbid symptoms; it never fails, however, if not corrected either by the application of means or the efforts of nature, to lay the foundation of structural changes.

The internal organs, on the reception of a quantity of blood beyond the requirements of their necessities, are either aroused to additional action, which is disease, or are oppressed by it, and hence unequal to their ordinary functions, which again is some form of disease.

The reason why the blood has a tendency to quit the surface of the body, on the occurrence of depressing causes, whether acting from without or within, may be thus simply explained: this fluid is maintained in circulation chiefly by two powers;—the contractions of the heart, and the contractions of the minute or capillary vessels on their contents. The first is an obvious and indisputable cause; it, therefore, follows, that the force which this impresses upon the blood must grow weaker, at every step, as this is removed from the *central* propelling impulse. The blood in the extremities and on the surface of the body is consequently, relatively to its motion in parts less remote from the heart, *feebler in its circulation, and proportionately more susceptible of derangement.*

From these remarks it is evident how important it is, in the attempt to preserve health, or to invigorate the body, to maintain in strict integrity the natural circulatory *relations* between the internal

and external parts of the system. The foregoing views, also, clearly show, and it is to this that the attention is particularly directed, that we have the power, and on an extensive scale, of modifying these relations by acting in various ways on the blood distributed to the cutaneous surface. We gather, in part, this practical knowledge from the fact, that numerous diseases arise from external agents *depressing* the action of the superficially seated vessels. The blood leaves these and accumulates within. The contemplation of these effects and the mode of their production, clearly shows, that by stimulating and giving additional energy or tone to the vessels throughout the surface of the body, we may not only prevent the frequency of such occurrences, but may materially improve the condition of the entire powers of life.

In the development of these physiological principles we have studied nature in her healthy and diseased states. It is from these sources we have gained the light which we are now endeavouring to impart. These principles are not based on loose or ingenious conjectures,—they are not the visions of an unscientific inquirer into vital operations. They are the result of much thought and repeated experiment and observation; and it is on these grounds that they are strongly urged on the attention of others.

XLIV. In analysing the relations between the internal and external parts of the system, we have hitherto studied such only as are displayed by the varying conditions of the blood. This inquiry

formed the first consideration: there is a *second*, which is equally worthy of notice, as illustrating the nature of the modifications in these relations, by changes in the functions of the superficially seated nerves. In the investigation of this branch of the subject, the facts, on which we shall reason, will not be of the same obvious or unquestionable character. To our own mind, however, they are equally real and indisputable.

All nerves are endowed with some animating principle—some power in virtue of which all vital actions occur. They are the media for the distribution of this power, whatever be its nature, derived from the brain and spinal cord. We admit that we cannot prove its existence. We have no instruments so refined by which we can either weigh or measure it. It altogether eludes our senses. But we are forced to believe in the existence of many things which do not allow of the application of such accurate methods of calculation. From effects we can frequently ascend to the consideration of causes, and though these may not admit of any clear ideas, it is not easy to disconnect them from our thoughts in researches after truth. They will often force themselves on our attention, and they are not without their utility in stimulating inquiry, and in giving greater comprehension to our views.

Many vital phenomena would appear to establish the existence of a pervading principle in the nerves. Mental emotion will, at one time, instantaneously suffuse the countenance with a deeply crimson

blush; at another, this will as suddenly be rendered deathly pale, or, perhaps, a cold and clammy perspiration bedews the entire surface of the body. Numerous other effects are produced by various states of the mind. Exhilarating feelings impart vigour and animation to all actions: the heart contracts with greater energy—the arteries carry a more vitalized current—the whole of the digestive organs participate in the change—the bodily movements are easy and pleasurable, and a new life seems to be awakened in every part of the system. The reverse of this picture is presented by depressing passions. The heart is probably altogether arrested in its motion, causing death, or hesitates and struggles in its efforts to perform its functions;—the vital powers generally are languid and embarrassed;—the body seems to have suddenly shrunk in its dimensions,—occupying less space.

We allude to these phenomena simply as illustrative of the doctrine that an animating power exists in the nerves, which is capable of being withdrawn or accumulated, in different regions, according to circumstances. The whole surface of the body is profusely endowed with nerves. The agent by which they are pervaded maintains the superficial vital actions, and, like the blood, is subject to modifications in its distribution. Whatever excites the one and increases its flow in any direction, proportionately augments the current of the other. The influence which depresses one, affects both.

These views are intimately connected with the con-

sideration of the *relations* uniting in one indissoluble chain the internal and the external surface of the body. The causes which modify the conditions of the latter, necessarily *produce a corresponding change throughout the whole of the nervous system*. If by the application of external means we give greater vigour to the cutaneous functions—stimulating the nerves and blood-vessels to increased activity—but always within the limits of health, every nervous filament of the body is placed in new and improved conditions, and, as an inevitable result, imparts a sounder tone of action to all the powers of life.

Whatever be the species of exercise, or class of remedies employed, or whatever states of mind be excited, whether curative or otherwise, their influence is always first exerted on the nervous system, and the variety of phenomena, or the bodily changes which follow, are the consequences of the impressions made on nervous matter.

XLV. The previous remarks have prepared the mind to study the effects of friction, as a remedial measure of great value, in the treatment of disease, and of all kinds of functional disorders. It is worthy of profound consideration. We hesitate not to say, that there is no remedy possessing the same extensive influence, and capable of the same general application in the endeavour to correct various internal and constitutional derangements, or which may be used with equal safety and advantage in numerous morbid conditions of the body. It is not recommended as a substitute for other judi-

ciously selected means, but as a measure that will powerfully co-operate with them in the attempt to re-establish health.

Our object is to exhibit the bearing of its influence on the constitution predisposed to consumption. There are two considerations which regulate the application of means to correct this condition. The one has reference to the lungs, and the other to the system at large.

We have already remarked that the lungs, in this class of individuals, from the contracted thorax, and other causes, frequently perform their important functions very imperfectly; and that they possess an extraordinary susceptibility of derangement. A change in the state of the atmosphere, or whatever slightly chills the surface of the body, is apt to give rise to various pulmonary symptoms, such as cough, difficulty of breathing, or pains in the chest. These symptoms originate in the disturbed balance of the circulation; *and they are evidence how delicately poised is the balance of the vital energies between the internal and the external surface.* They cannot be imagined to exist without the one surface acquiring a portion of that blood which was previously distributed to the other, and this necessarily implies *congestion* of some of the internal organs. The continuance, or the repetition of this condition, lays the foundation for the production of those structural changes which constitute consumption.

It is in our power, by means of friction, to invigorate the functions of the lungs, and lessen, in an extraordinary degree, their susceptibility of derange-

ment. We can modify the vital actions on the whole surface of the body. We can impart to the nerves and vessels on which these depend, additional tone, not temporary but permanent in its character; in the same manner as bodily movements steadily persevered in, develop those muscles which are particularly called into play. There is no difference in the general results in the two cases. They both determine to the several regions which are directly acted upon, an increased quantity of blood and nervous energy the effect of which is augmented growth of the parts or the accretion of organic matter.

By repeated friction with the flesh-brush, we establish on the external surface conditions which are capable of resisting the ordinary depressing influences from without, as well as a variety of depressing influences which occasionally occur from internal changes. We give to this surface permanently more blood and nervous power, and in the proportion in which we increase these, in connexion with healthy *and not temporarily excited action*, we confer upon them those properties which render them a protection to the system against the injurious agency of numerous causes of disease.

It is impossible to produce these effects on the surface of the body without improving the qualities of the blood and invigorating the circulation generally. Every internal organ is placed under circumstances more favourable for the correct performance of its functions. The constitution acquires new life.

This remedial measure not only tends to remove the frequent congestion of the internal viscera, manifested by various morbid phenomena, but is a means of furnishing them with a more vitalized current stimulating them to a wider range of vigorous operations.

These views are corroborated by extensive and accurate observation. They rest on the broad basis of numerous and elaborately analysed facts. The consciousness of the importance of the measure to humanity, at large, is the apology, if any be required, for thus strongly pressing it on the attention of others. The task is far more pleasurable than in labouring to exhibit the value of a purely medicinal agent, the administration of which, whatever might be its properties, would demand a knowledge of the powers of life, and of the particular conditions of the system to which alone it would be applicable,—considerations and adjustments which fall exclusively within the sphere of the professional adviser.

The application of friction requires no refined calculations. It cannot possibly be fraught with evil, and it is certain to be pregnant with a large amount of good. We have endeavoured, though imperfectly, to lay down, in clear and simple terms, the physiological principles explanatory of the influence which it exerts on the animal economy.

XLVI. This measure is not to be regarded as simply preventive of pulmonary disease. It has other claims on attention. It co-operates powerfully with other remedies in arresting the progress of existing structural changes. When we consider that every step

in the march of phthisis, from the manifestation of the first to its most aggravated symptoms, is accompanied with the gradual withdrawal of blood from the extremities and surface of the body, being distributed in varying proportions on the whole of the internal organs; *it must be evident, that any means which will tend to lessen or counteract this disturbed state of the circulation, will be of practical use.* Repeated friction on the whole of the cutaneous surface will facilitate, in an important degree, the accomplishment of this object.

In consumption it is seldom that we have the lungs alone affected. From the first there is a constitutional condition,—one of weakness and derangement out of which the disease arises. During its progress—at every stage of the disorganization of the lungs,—the liver, the stomach, the intestines, and the kidneys, as well as the entire of the mucous membrane extending from the mouth to the anus, sympathise more or less with the predominant local affection—in plain language they gradually become disorganized themselves.

These extensive morbid effects are largely to be ascribed to the broken balance of the circulation. The blood is no longer maintained in equable distribution throughout the system. It quits the extremities and surface of the body, where its motion is the least vigorous, and accumulates within, producing *congestion* of the different viscera, particularly of the mucous membrane of the air-passages, of the stomach and bowels. This membrane is exceedingly susceptible of derangement. It is richly endowed with

nerves and blood-vessels, and its liability to disease *is in the ratio of these conditions.*

The disturbed circulation is not the only prejudicial cause which we have to contemplate. It gives rise to another important effect. The blood being drawn from without, inwards, from the debility of the powers of life, it aggravates the existing congestion of the lungs, narrowing the breathing capacity of these organs, and hence places the blood under unfavourable circumstances for extensive chemical changes, so that the current which is kept in circulation is deficient in the required vital properties.

It is in the power of art to lessen the tendency to the production of these effects. A blister, when applied to the chest, the liver, or the pit of the stomach, frequently removes the pains for which it is prescribed. And why? Because it stimulates the subjacent organs suffering from congestion and enables them to throw off a portion of the blood by which they are oppressed.

What is friction on the surface of the body, in its physiological effects, but one large blister without its irritating and disturbing influences? Does it not bring to the surface a greatly increased quantity of blood, *and in such ratio does it not relieve the whole of the internal organs?* The blood can be drawn only from within, and the different viscera will part with it, with a facility in the inverse proportion to the length of time the congestion has existed; or in simpler terms, the more recent the

origin of this condition the more readily will it be relieved by friction.

To bring to the surface any given quantity of blood, and permanently to maintain the improved cutaneous circulation, is the first important step towards producing further changes in the whole of the internal organs. The quantity though small which they may have parted with, leaves them, to this extent, in a state better fitted to perform their functions; and at the same time, *an increased amount of blood is necessarily thrown into circulation*, and conveyed in an invigorating current to these organs enabling them to act with greater correctness and freedom.

These are the progressive steps towards the restoration of health in all morbid conditions of the body. The various tissues are gradually losing a something which is unfavourable to their action, either from its quantity or quality, and gaining in return a something more in harmony with their demands and necessities.

Why not attempt to promote by external means, in urgent cases of disease—disease chronic in its character and difficult of cure—those changes in the distribution and qualities of the blood, which nature, in her unaided and often interrupted efforts, labours to effect? The study of her operations shows the mode in which she proceeds and the results which follow from her exertions. The vital instruments through which and by which she accomplishes her ends, are open to our influence. We can modify

the condition of every one independently of drugs. We can direct her energies to this region, or withdraw them from that,—we can impart new life to the vital powers by judiciously selected and appropriately enforced measures.

When consumption is manifested by unequivocal symptoms,—by the dry and hacking cough,—occasional tightness or pain in the chest,—by the loss of flesh, and the relaxed state of the bowels, friction with the flesh-brush, steadily and perseveringly applied to the surface of the body, is one of the most valuable remedial means at our command. To effect a cure we must improve the circulation generally. We must re-establish, as far as it is in our power, the natural distribution of the blood. Every step towards this is mitigating the tendency to the structural changes of the lungs,—is affording some relief to the aggravated symptoms of the disease.

We are not thus strongly recommending the employment of friction, in the treatment of phthisis, from theoretical considerations only. These, however, are not without their value. When the result of well-observed and carefully analysed facts, they are essentially necessary to guide and regulate the application of all remedial agents. We can appeal, however, to experience in support of the beneficial effects which flow from the practice, and have briefly detailed them in a recent publication.*

* CASES ILLUSTRATIVE OF THE CURE OF CONSUMPTION AND INDIGESTION. — London: W. S. Orr and Co., Amen Corner, Paternoster Row.

XLVII. We cannot close these remarks on the advantages of friction, in reference to the consumptive predisposition, without a few words in regard to its utility in all cases of scrofula. In these it is an invaluable application. The circulation in the strumous habit is invariably deficient in power. Neither the nervous nor the circulatory system possesses those qualities essential to healthy action, and hence the tendency to glandular and other forms of scrofulous disease. The remedy, in all such states of the constitution, will agreeably surprise by the extent and character of its results. In its efficiency it is superior to all other measures. We generally recommend it to be used in conjunction with the shower-bath, or the dashing of cold water over the surface of the body. After this has been well rubbed for ten minutes or quarter of an hour, the water may be applied according to either mode, after which, friction, for the same length of time, is to be employed. The combination of the two facilitates and increases the beneficial influence of each. They do not exclude the use of internal means, but if perseveringly carried out they will generally render them unnecessary.

CHAPTER VI.

CONSIDERATIONS ON DIET AND ON THE PROPER
MANAGEMENT OF THE DIGESTIVE ORGANS.

XLVIII. THERE are few subjects which present greater difficulties, in the attempt to lay down exact rules, than the consideration of diet in its relation to the necessities of the animal economy. What may be fitted to the digestive powers of one individual, may be prejudicial or less favourable to those of another. Different species of plants are adapted to different soils. Each of these possesses elements essential to the nutrition and development of vegetable life. The plant by a law as unerring as instinct, sends its minute fibrils in search of that kind of food which will alone meet its requirements.

It is to a great extent the same with the digestive organs in man. These have their peculiarities,—their varying degrees of power characteristic of their condition, either natural or induced by the influence of numerous circumstances. The same food will not furnish an equal amount of nutriment to all. The organs of one will find in it elements in harmony with its wants: those of another will fail to extract from it what is essential to the health and vigour of the system.

These peculiarities are largely to be ascribed to what is designated the artificial state of society. They inevitably follow from the progress and refinements of civilization, and are deductions to be made from the great amount of good which accompanies the improvement in the conditions of man, and we must deal with them as effects springing out of causes over which we have little control.

XLIX. It must be clearly understood that we are not writing for the robust, but for the delicate or those predisposed to consumption; and, therefore, our remarks must be regarded as having a partial rather than a general application. They must be received somewhat in the light of remedial suggestions, and as every medical adviser has his peculiar views and notions, which may possibly be prejudices, we having our own shall claim the right to state the grounds on which they rest.

In the preceding pages we have laboured to present a general idea of the structure and functions of the lungs, and have pointed out a variety of circumstances favourable as well as detrimental to their action: we have dwelt, at some length, on the beneficial effects flowing from several species of bodily exercise, and we now by a natural transition come to the study of diet and the management of the digestive organs:—we arrive at the consideration of food which maintains the animal machine in motion. It will not invigorate the system unless associated with other conditions essential to health. Alone it will not accomplish the desired end: aided by these, when the kind is properly selected, it will

effect important changes in the character of the vital powers.

It cannot be too strongly impressed upon the mind, that sacrifices of ease and indulgence must often be made to secure health; and he who studies its requirements the most sedulously, and carries them out the most faithfully, will unquestionably gain the largest amount. This is a something which is to be acquired in the same manner as riches. There are laws which are to be observed in the attainment of both. Each is accompanied with its peculiar sacrifices—each calls into play various mental faculties, and the results in both cases are according to the steadiness with which the several objects are pursued. If anything more than another is calculated to irritate the temper of the enlightened practitioner, it is occasionally to witness in the affluent, day after day, the same or similar symptoms arising from idle and luxurious habits, and continued with a pertinacity that is equalled only by the frequent injunctions to correct them.

Persons of this class are in some measure like plants, or they must imagine a similarity in their constitution. They seem to expect that light, air, and all the circumstances which co-operate in the production of health, will come to them. The condition is, that they must go in search of them, and like the bee they will bring home with them a something which nature will work out for her general good. It is this something,—the improved action of the vital powers, which is indispensably necessary to give tone to the digestive organs. It will correct the fastidiousness of the appetite, and enable the

stomach to extract from the simplest food the elements of nutrition.

L. In the consideration of diet we must keep in mind the vicissitudes of the climate in which we live,—the sudden transitions from heat to cold, and other atmospheric conditions. The nourishing and stimulating character of the ingesta must be in relation to these circumstances. It is not our intention to analyse the properties of various articles of food, exhibiting in elaborate detail what should be taken or rejected. We are no great admirers of the exact rules occasionally laid down for adjusting the demands of the stomach. Variety, within moderate limits, is not only agreeable but frequently useful.

The first important condition is, *that the food shall be nutritious*: the second, *that it shall be adapted to the necessities of the digestive organs*; and the third, *that it shall be moderate in quantity*. We will briefly examine the subject under these several heads.

Animal food, as a rule, should be taken at least once a day, and if the appetite is good, resulting from active out-door pursuits, may be taken twice with advantage. The amount and quality must be regulated by these considerations. For breakfast we should advise bacon, or eggs lightly boiled, with cocoa or chocolate. Coffee will often suit the heavy, phlegmatic or scrofulous constitution. It is useful as a stimulant, but it has little to recommend it beyond this property, the value of which we are not disposed to underrate. To tea there are strong objections. It excites and weakens the nervous system. It will impart a temporary feeling of ease and com-

fort,—will exhilarate the spirits and facilitate intellectual operations. It is on these grounds that it is often prejudicial. The effects which it produces are evidence of its direct and extensive influence on nervous matter. They are effects which must necessarily be evanescent, and the cessation of them leaves the vital powers depressed in the ratio of the previous excitement. Where the constitution is delicate, or morbidly susceptible of impressions from the predominance of the nervous temperament, the continued use of tea is a source of a variety of distressing symptoms.

Roast meats are always to be preferred to boiled, where the consideration is their *nutritious* qualities. It is scarcely possible to imagine a more effectual method of extracting from them the principles which the animal system requires, than by submitting them to the boiling process. From the commencement of this operation they are gradually parting with their nutritious elements,—*elements essential to stimulate the stomach to the performance of its duties.*

Experience teaches every one the kind of meat which is the easiest of digestion, and experience in such matters is a guide which is not to be dispensed with. But it must not be forgotten that we frequently err in tracing effects to causes. We often fail in seizing the latter. A person partakes of several articles at table, and if afterwards a feeling of discomfort arises, he refers it at once to this or that dish, when the true explanation would probably be found in the quantity or the variety of what he had enjoyed.

We must consider that every article of diet *has its specific action on the stomach* arising from its different properties. No two will stimulate this organ alike, nor make the same demands upon it; and, therefore, simplicity of living, not excluding altogether variety, but confining this within sober bounds, is one of the essential conditions of health.

Every organ is a machine capable of a given amount of labour, and if called upon to do more than is in strict harmony with its ability, it always does it imperfectly; and what is worse, it invariably disturbs the delicate adjustments of the vital powers. The inordinate exertions of the stomach, whether arising from food too great in quantity or difficult of digestion, are at the expense of blood and nervous energy, and the expenditure of these is an actual loss to, and the source of the derangement of, the entire system.

The ingesta must be nutritious and more or less stimulating in their nature to invigorate the body. Animal food combines these two qualities in the required degree, and though milk and farinaceous articles of diet, are unobjectionable, they must not be regarded as substitutes for it when it can be taken without inconvenience. It is indispensably necessary to give tone to the system,—to place the powers of life in a condition to resist the depressing influences of atmospheric and other causes.

We are not considering what is proper for the invalid or the robust, but for those who have a tendency to disease from a delicacy of constitution; and we are supposing that the diet which is here recom-

mended will be aided in its beneficial effects by the co-operation of all those circumstances which conduce to health.

LI. Persons must restrict themselves in some measure to such articles of diet as experience has taught to suit them the best. No satisfactory explanation can be given why one should agree in preference to another with the stomach. We may say that one is more difficult of digestion than another, which is admitted; but the likings and antipathies of this organ, if we may so express ourselves, are not to be accounted for on the different degrees of the digestibility of food as established by direct experiments.

It must not, however, be forgotten that many of the delicate and fastidious partialities of the stomach, are largely to be ascribed either to an improper mode of living, or to the absence of invigorating out-door exercise, which is essential to give a healthy tone to the digestive organs. Such conditions are, therefore, generally to be regarded as morbid in their character, or bordering on disease. The study should be to correct them, and it is extraordinary to what an extent this can be accomplished when the efforts are steadily directed to this end.

A steak or mutton-chop is one of the most nutritious articles of food, and when so cooked as to retain its juices, is among the most digestible, if the action of the stomach be not disturbed by a variety of ingesta, or by wine, spirits or malt-liquor.*

* The best mode of cooking a steak is on the gridiron, the fire not being so hot as unduly to hasten the process; and it should be *constantly* turned, sprinkling occasionally a little

There are few among the delicate that this will not agree with, and it will yield a large amount of nutriment.

LII. On the necessity of moderation in diet, many just and pertinent remarks might be made. As a rule, mankind eat far more than the necessities of the system demand. But it would be absurd to attempt to specify the extent of the legitimate requirements. They vary from day to day according to the exercise of mind and body. The excess, though it might, under other circumstances, be unobjectionable, measured by the quantity of food, is frequently to be laid to the charge of those who lead easy, luxurious and inactive lives. They live to eat and do not eat to live.

It must be understood that the benefit derived from food is not in the ratio of its quantity. As previously observed, the stomach is a machine which is constantly varying in the degrees of its efficiency. If we may be allowed the expression, it does not always turn out its work in the same elaborated or finished state. Whenever it is overtasked, the produce of its embarrassed efforts is not such as is fitted to impart health and vigour to the system. A little work well done is far more ad-

salt on each surface, and when about two-thirds finished, it should then be put on a hot plate, covered by another, and placed in the oven for a short time, to be there completed. The stomach that cannot digest this is indeed weak. The steak has not lost one drop of its juices, the salt, by its effect on the muscular fibre, in conjunction with the heat,—creating a kind of impenetrable layer on each surface which prevents the escape of them.

vantageous than a great deal loosely and slovenly executed.

Keeping in mind that we are addressing those of delicate constitution, it may further be remarked, that comparative rest of body is desirable after a substantial repast. Mental or corporeal exertions would be prejudicial. Nature must be allowed to perform one important business at a time. If compelled to undertake other duties, beyond such as are perfectly light and agreeable, she will respond to the demands, *but inefficiently in all directions.*

LIII. We must now say a few words on another subject, on which there is great difference of sentiment, and no small amount of prejudice, viz., *the influence of stimulants on the animal economy*, such as wine, spirits, and malt-liquor.

Mankind in their ardent efforts to promote the good of their species, whatever direction their zeal may take, seldom find the just medium between the two extremes. They are always on the confines of one, and all who in their views fall short of this wide and accurately delineated boundary, are often treated in a manner that reminds one of by-gone times, rather than of the courtesy and liberality which should distinguish a highly civilized state of society.

Good things—and what in nature has not its beneficial properties, in moderation are always good. The abuse is the evil, which is not inherent in them, but is superadded by the excess. If there had been one tithe of the talent devoted *to the study of the physiological effects of wine, and malt-liquor on the*

animal economy, in its different states of vital action, that has been expended in displaying in just and revolting details,—the moral—the social, and the constitutional evils consequent on the abuse of stimulants, opinion on the subject would probably have been much less divided than it is, or at all events those who approve of the temperate use of them would have had numerous well-ascertained facts, if not established principles, on which to rest their views.

We are not going to enter at length into the consideration of this matter,—we have not the time nor is this the fitting occasion. The inquiry is not altogether foreign to the investigation of causes which tend to invigorate the body.

We have endeavoured in the foregoing pages to point out the various ways in which the powers of life may be improved in their tone and action. We have stated that in the consumptive tendency there is a prevailing constitutional weakness, which is inherent in every organ, varying only in its degree. This, we contend, is in a great measure to be corrected by the judicious employment of means. Whatever gives additional strength to the system *counteracts the predisposition to the formation of tubercles. These spring out of local and general debility.*

Wine or malt-liquor will not agree with all constitutions. Experience again must guide us. But when they produce no unpleasant effects,—no flushing of the countenance,—no burning heat of the hands,—no marked acceleration of the pulse,—no disturbance of the functions of digestion, but are found to give rise

to pleasurable feelings, imparting the ability to undergo with ease greater or renewed bodily exertions, they are then beneficial in their influence and may be justly ranked among the preventive means of consumption.

Wine and malt-liquor possess two distinct properties, and each requires a separate examination. They are stimulants, and at the same time furnish the elements of nutrition, especially malt-liquor. The value of the stimulating property has never been accurately analysed in its relations to the vital powers generally. It has been condemned, without due consideration, as prejudicial to life.

Let us briefly endeavour to ascertain how the animal system labours,—through the agency of what means, and in what manner these co-operate. The source of all movements and of all vital actions *is the nervous system*. It is this which gives the necessary stimulus to every fibre and organic molecule, in virtue of which they perform their important duties. The nervous system in its relation to all organs, is that of the stream to the water-wheel and its dependent machinery. It is the exciting cause of all forms of vital manifestations, whether as displayed in digestion, secretion, absorption, circulation, or any other function. As the movements of the inert complicated apparatus grow feeble with the diminished supply of the water, so does the living system, with all its exquisite springs, pulleys, and finely-arranged cords, falter and hesitate in its actions, *whenever the current of the nervous energy is inadequate to its demands*.

The cases are so far parallel. The extraordinary difference which they present in regard to the nature of the instruments which are put in motion, and the results which follow, do not disturb the general accuracy of the illustration. According to this view it is, therefore, evident, that whenever we can give additional energy to the nervous system,—awaken it to the vigorous performance of a wider range of duties, keeping these within the natural requirements of the vital powers, we are conveying through the medium of this system, to all parts of the body, an augmented current of nervous energy, *thereby imparting new life to every molecule of animated matter*. The blood is propelled in a fuller or more abounding stream,—the stomach and all the digestive organs act with greater facility and correctness, and the bodily movements are executed with greater ease.

LIV. Depression and languor are not inevitable effects of this temporary improvement arising from the use of stimulants. The doctrine which contends for these results does not rest on a just analysis of the influence which has been exerted. How has it operated? In giving greater vigour to the circulation, and to the functions of digestion, the animal system has been placed under circumstances favourable for the more extensive chemical changes of the blood in the lungs, and hence it has acquired additional vital properties,—it has lost a greater proportion of those elements which have become useless, and prejudicial if not expelled; and it has gained in the same ratio those which are required for vital action; consequently a *change* has

been induced in all the functions of life by the improved tone imparted to the nervous system, which does not subside with the cessation of the temporary stimulus. A something has been added to the body essential to its healthy operations—a something which is an actual gain. Further, if the digestive organs have been enabled to act with greater efficiency, a larger amount of nutritive matter has been thrown into circulation and of a quality better fitted to invigorate the animal system.

If we suppose the stimulant to be repeated according to existing necessities, and prescribed only when its obvious effects are beneficial, to determine which requires no refined calculations, it is clear that it is one of those means which may be employed with advantage in correcting constitutional debility.

Nature in such cases wants the temporary aid of crutches to enable her to discharge the duties imposed upon her, and it rests with us to analyse their character and to supply them according to her exigencies.

Let us not be misunderstood in these remarks. We are not indiscriminate advocates of the beneficial effects of stimulants. They are not imperatively required by those in robust health, and in such even in moderation they are rather prejudicial than useful. But whenever a great demand is made upon the powers of life, either by mental or bodily exertions, inducing fatigue, languor, and a feeling of exhaustion, they will then in moderation be fraught with great good. Nature, at this time, wants their assist-

ance, and is grateful for it; and if rendered in association with other circumstances—as the social, enlivening and intellectual circle, there is the stimulus of mind, in the interchange of sentiments and the flow of animal spirits, which gives to this temporary aid a large measure of invigorating influence. Whenever there is constitutional debility, whether predisposed to consumption or scrofula, wine or malt-liquor, *if they agree with the system*,—that is, if they produce none of those effects to which we have just alluded, may be taken with unquestionable advantage. Of the wines, port is the best, and when this is not agreeable to the palate, or does not suit the digestive organs, madeira or sherry. Ale is to be preferred to every other preparation from malt. It is more strengthening than porter, though there is no objection to this, if it be pure. It is often much adulterated.

LV. We have hitherto considered the stimulating effects only of wine and malt-liquor, and have endeavoured to point out under what circumstances they are useful. We have ventured on a rationale of their influence. There is another quality to be studied in connexion with them, viz., *the nutritive properties* of these stimulants. They both possess them, especially malt-liquor; and therefore the temperate and occasional use of them is to be recommended on two important considerations. They strengthen while they gratefully excite the powers of life. It is the combination of these two qualities which give them a peculiar claim to attention; and to extract from them the benefit which they are

calculated to confer, it is only necessary to be acquainted with those conditions of the body in which they are indicated,—to watch their operation, and to regulate their employment according to the effects produced. Our reasoning is not to countenance abuse, but to direct the legitimate use of stimulants which are intrinsically good in moderation.

Much has been said of the evils which arise from an unrestrained indulgence in them which cannot be too strongly condemned; but are there no evils to be traced to abstaining from them? Do not disease and death frequently occur from an expenditure of the vital energies, without a corresponding supply of stimulating nutriment? We have known various instances of the kind. The ordinary articles of food are the materials on which the stomach has to work, but it often flags in its labour, and is unequal to its duties unless assisted by stimulants. The nervous system—the water-wheel of the living machine—wants the vigorous animating current to set the springs of life in healthy motion.

LVI. We now enter on the examination of another subject in reference to the delicate, or those predisposed to consumption, viz., the management of the digestive organs. This is a wide and important inquiry, but the previous considerations dispense with many remarks that would otherwise be necessary.

From the foregoing investigations it is evident that much is to be accomplished in strengthening the system, and in correcting the predisposition to pulmonary disease by attention to diet and different kinds of exercise. We have said nothing on the

use of medicinal agents in the correction of the consumptive predisposition. We are anxious that the improved tone of the vital powers shall be produced independently of them. They will rarely be required where other means are judiciously employed.

To secure the conditions of sound health the constitution must be free from the disturbing influence of drugs. The constant use of tonics, alteratives, purgatives, and their various combinations, is prejudicial to the system. *It creates the necessity for their repetition.* Let the organs be taught to depend on their own natural actions, aided by fresh air, exercise, and proper diet. When no structural disease exists, but simply functional derangement or weakness of the powers of life, these are the physicians with which a good understanding should be cultivated. Health lies within their affluent resources.

Nothing is so injurious to the system as the practice of promoting the frequent action of the bowels. We teach them to anticipate the co-operation which we furnish, the nature and extent of which evil are imperfectly appreciated. If we consider that the surface of the stomach and intestines, with which drugs come in contact, is rich in nerves and blood-vessels and engaged in important functions, supplying those materials and exciting those contractions which are necessary to the changes of the food, to its thorough elaboration, and its separation into nutritious and refuse-matter: and further reflect that the surface of one large portion of the bowels, in immediate contiguity with the stomach, has thousands of minute pores or mouths into which enters

the nutritious fluid on which the entire system depends for its existence, a general idea may be formed how essential it is not recklessly to disturb the vital operations of surfaces, varying in their actions, but all equally important to life.

Nature, if we study her and interpret her language aright, is full of instruction. In a great number of those cases in which there is delicacy of constitution, whether manifesting or not a predisposition to any particular disease, the bowels are usually prone to inactivity—they are torpid in their functions. IT IS WELL THEY ARE SO AS LONG AS SUCH WEAKNESS EXISTS. The constipation is evidence of an inability on their part, from a deficiency of vital energy, to perform their duties;—they ask for time to gather together their powers to effect this, and when the desired result follows, whether it be on the second or third day, it will be more conducive to the well-being of the body than a more frequent action arising from adventitious means. If the bowels require assistance from without, a simple glyster is the safest. It operates where it is wanted, and does not in any way disorder the delicate functions of those surfaces which are the seat of extensive vital processes. Castor oil is the next least injurious aperient. Repeated friction, however, on the abdomen, and the occasional drinking a tumbler of cold-water the first thing in the morning, will often render other means unnecessary.

We have met with few instances of inveterate constipation, occurring as a constitutional symptom, that was not thoroughly corrected by the employment

of the two last-named remedies. Friction over the abdomen, morning and evening, for a quarter of an hour or a longer period, is an almost unfailing application, if the patient can be induced to persevere in its use. There is often a difficulty in this. Sometimes there is an urgent anxiety, not from any unpleasant symptoms which exist, but from an apprehension of the necessity for the immediate action of the bowels, which interferes with the practice recommended. This may not for two or three days give rise to the desired effect, but it is gradually exciting the whole of the abdominal viscera—stimulating them to more vigorous operations—increasing the production and flow of their respective secretions, and thus placing the bowels under circumstances which ultimately compel them to act.

When this follows from the unassisted efforts of nature,—save from external means, it must be kept in mind that every organ of the body participates in the altered vital conditions induced, and has contributed in various ways to the result in question, which is not simply a local improvement—a more healthy state of the bowels, but implies a salutary change in the whole of the vital powers. It is in this light that the subject is to be viewed in order that we may appreciate the character of the relations between the bowels and the rest of the system, and feel the full importance of not disturbing the functions of the former by our rude or inconsiderate interference.

It is scarcely possible to exaggerate the evils which arise from the practice of taking purgatives, in some

form, whenever the bowels fail to do their duty. With some persons it is an established habit. They have no confidence in nature, nor would they have in simple and efficient means requiring time, in the first instance, to produce the desired effect. If, however, the constitution be weak, and predisposed to consumption, the practice is to be rigorously abstained from—it is fraught with certain mischief. The object must be to husband the powers of life, and, therefore, all unnecessary sources of expenditure,—and the frequently excited action of the bowels is one of these,—are to be carefully guarded against.

CHAPTER VII.

REMARKS ON CLOTHING.

LVII. DIET and clothing must always have a general reference to the climate in which we live. Nature has given to every region an abundance of vegetable and animal productions applicable to the necessities of its inhabitants. Our own is an approximation to a medium in the conditions which characterise the extremes. We are neither broiled nor frozen to death by the intensity of heat or the severity of cold. But where these extremes prevail they are generally less marked by sudden transitions, and hence less care is required in modifying individual circumstances in anticipation, or in consequence of, frequently recurring vicissitudes.

Our own climate is perhaps more variable in its temperature than that of any other, and in part from its insular position and limited surface. One day we are greatly oppressed by heat and begin to disencumber ourselves of a portion of our superfluous clothing;—the next day the sun is obscured, the weather is gloomy, and the wind is in the east, or north-east, and we are chilled by the change,—we make substantial additions to our dress—light the fire and are grateful for its cheering influence.

It is these abrupt and extreme transitions which render the delicate exceedingly liable to disease. The succession of a few dry, clear, and scorching days impart an extraordinary stimulus to the whole animal economy. The blood circulates with greater freedom, and an increased amount is distributed to the surface of the body, exciting its nerves and minute vessels to a wider range of vital action, *and proportionately augments the susceptibility of such surface to prejudicial influences from without.*

Let us briefly consider this state of the surface of the body, and the effects which arise from a sudden modification of it. In our first physiological production,* these circumstances formed part of an important and interesting inquiry, and were elucidated by a variety of experiments.

The quantity of blood in the animal system is subject to constant changes in its distribution, according to bodily exertion, mental activity, as well as the temperature of the medium in which we live. Each season of the year has a *character* of circulation in harmony with its prevailing conditions, and hence each is distinguished by a tendency to particular diseases. The change in the diffusion of the blood is accompanied by two phenomena highly deserving of attention. THE PROPERTIES OF THE BLOOD CHANGE WITH ITS ALTERED DISTRIBUTION; and at the same time, and in a corresponding degree, THE ACTIVITY OF THE NERVOUS SYSTEM, AND ITS

* AN INQUIRY INTO THE LAWS OF ORGANIC AND ANIMAL LIFE. Edinburgh: Maclachlan and Stewart; and Simpkin and Marshall, London. 1829.

RELATIONS TO ALL ORGANS ; so that the powers of life have their regular and established periodical conditions in accordance with the seasons, modified only by the vicissitudes which belong to each.

LVIII. The gradual transition of winter into spring, acts on the animal and vegetable creation in the same manner. There is no difference in the general effects. The warmth which is communicated to the soil brings out the first flowers and the virgin leaves of the year ;—the continued and increased temperature, lures others into open day, and the process goes on until spring, with its rich verdure and blossoms, passes into summer, which takes up the chain of progressive changes carrying these out to further development.

It is in spring that vegetation may be said to be in infancy, in regard to those general properties of life which characterise the same period in the human species. The leaves, in which the sap circulates, are exceedingly susceptible of external depressing influences. The reason is, that these vessels are only newly formed, conveying the smallest imaginable current, and as the sap is thus *minutely* subdivided and wanting the stimulating qualities of a more matured state, the leaves present a surface, like that of the human infant, marked by the extreme delicacy of its vital operations, and hence liable to be injuriously affected by the sudden alternations of temperature,—by the transition from genial warmth to a chilling degree of cold.

The blood is drawn in greater abundance to the surface of the body by the returning heat of spring

and summer, and though not like the sap in the plant for the purpose of creating and developing new organs, it flows nevertheless to such surface, *in order to perform more extensive vital processes than would be natural to a less active state of the superficial circulation.* This is evident from the readiness with which perspiration takes place at these seasons on slight exertion, or independent of any muscular efforts. The phenomenon indicates the altered distribution and the modified properties of the blood. It is an inevitable result consequent on the increased generation of animal heat, and the stimulating influences from without acting upon the surface of the body. A similar condition of the circulation is produced by an oppressively warm room, and particularly when conjoined with vigorous exercise, as dancing and various exciting amusements. It is necessary that this fact be kept steadily in view being fruitful in important practical applications.

LIX. Such condition of the cutaneous surface, in those of weakly constitution, is accompanied with a peculiar susceptibility of derangement. The superficial blood-vessels are readily constricted on the body being exposed to a cooler medium, the consequence of which is, that the blood is determined from without, inwards, more or less to all the internal viscera; and according to the predisposition of these to disease, will give rise to various functional and structural changes. If the lungs be the most liable to disorder, from the delicacy of their organization, they will suffer first from the disturbed relations between

the internal and external surfaces. The effect may be acute inflammation, or inflammation in a sub-acute form ; or it may be congestion of the pulmonary air-cells, exciting no immediate or appreciable symptoms, *but laying nevertheless a foundation for those modifications of vital action which ultimately terminate in the development of consumption.*

Hence the external surface, under all circumstances, but especially in those in whom the functions of life are feeble, is to be regarded, from its susceptibility and frequency of derangement, as one of the great inlets of disease. Its power of producing this is somewhat in the ratio of its extent, for this is a measure of the magnitude of its relations to the whole of the animal economy, whether these relations be analysed in reference to the nervous or sanguineous system. It is not possible to separate these in the investigation of the causes and effects of morbid action. They are indissoluble parts of the same vital chain, and whatever influences the one will correspondingly affect the other.

LX. The foregoing physiological considerations on the periodical and occasional modifications in the circulatory conditions of the body,—modifications in harmony with the revolution of the seasons, and with all temporary changes of the atmosphere, are necessary to the appreciation of the practical remarks deduced from them in reference to the important subject of clothing. Without such considerations we should only half inform the mind. Our wish is to convey such an amount of knowledge, in intelligible language, on the functions of life, or on that class of

functions immediately connected with our inquiry, that its application shall be easy and obvious to all. For the truthfulness of the physiological principles laid down, we claim the confidence of the reader. This is the extent of our demand; but from the manner in which they have been treated, he is clearly in a position to apply them to the existing necessities of the system. If the means which they suggest are capable of not only protecting the body from the insidious inroads of disease, from the invigorating influence exerted on the powers of life generally, but are likewise equal to the correction of severe morbid conditions, they offer to the mind valuable resources which may be brought into play under a variety of circumstances which do not fall within the limits of this inquiry to specify.

The object of one part of dress is unquestionably comfort, and, therefore, it is always more or less adapted to the different seasons. Those, however, who are delicate or predisposed to consumption, should be careful in following any general or prevailing rule, especially at those seasons the temperature of which is occasionally oppressive. The robust may be independent of any nice calculations as to the amount or kind of clothing agreeable or desirable at these times; but those less vigorously constituted, who are indeed susceptible of atmospheric vicissitudes, *must always allow these to regulate their conduct.* They must not be like the spendthrift, who saw a solitary swallow on the wing and disposed of his apparel in expectation of warm and genial days. They must look with suspicion on the

brightest, and apparently settled weather, knowing that in this climate we have suddenly an east and north-east wind, and cold, damp, chilly nights, that will often unexpectedly occur—breaking the delightful monotony of a succession of warm and genial days. Considering these circumstances, and the importance of maintaining a healthy circulation on the surface of the body, in those especially of delicate constitutions, we question the propriety of laying aside the use of flannel, worn next the skin, though the heat of the sun may seem to render such change desirable.

We are here alluding to flannel, and by inference implying the necessity of its use though we have made no remarks upon it. Its utility is almost too obvious to need any, and this is one reason why it has not been brought under consideration previous to pointing out the risk of its discontinuance.

If the reader will for one moment reflect on the influence which we have ascribed to measures, regarded as preventive of consumption, and why they are viewed in this light—on the just conception of which hinges their appropriate application on his part, few words will be required to show that flannel is indispensably necessary to co-operate with these measures,—to protect the conditions which they produce on the surface of the body and throughout the animal economy against depressing causes acting from without. Young or delicate females should wear flannel on the greater portion of this surface. The chest, the abdomen, the loins and the thighs should be equally clothed with it, varying the kind or thickness of it according to the seasons. In

proof of the advantages derived from it, we could adduce numerous instances where indeed no other means were employed, or where they had failed in removing many distressing symptoms. The same observations apply with almost equal force to the other sex.

LXI. In treating of clothing, in connexion with the consideration of measures proposed to prevent consumption, there is one article of dress almost in universal use among females, viz., corsets, on which it is necessary to make a few remarks. The subject is indeed hackneyed from the frequent reference which has been made to it by medical writers. We are fully aware that eloquence, persuasion and science in their appeals to the sex, will be unavailing in the thorough correction of what is unquestionably an evil, and, in many instances, one of a very serious character.

In the previous pages of this inquiry we have alluded to the advantages of several species of exercise, tending to enlarge the chest, and consequently giving freer play to the action of the lungs. Such means will be comparatively of little use, if the thorax is constantly tightly bound with corsets. These give a form and capacity to the chest which are not natural, and produce effects which are in the highest degree prejudicial to health. If the more vigorous of the sex can wear them with apparent impunity, those of delicate constitution and predisposed to consumption, are not equally exempt from their baneful influence. They have no exuberant vital energies—no superfluous stock to allow of any deductions. They must

study to make the most of what they have and endeavour to multiply it with prudence and economy.

The compression of the chest permanently diminishes its capacity. It prevents the entrance of the required quantity of air and the uninterrupted circulation of the blood through the lungs; and hence it is one cause which aggravates the tendency to the structural changes of these organs. If corsets are worn *they must not interfere with the important functions of respiration.*

A celebrated Edinburgh professor always descanted at some length in his lectures on the evils of stays, and he never failed to observe that his own daughters were not allowed to wear them. They were certainly, in form, exquisite specimens of female beauty.

LXII. There are circumstances which suggest further remarks on clothing,—and circumstances independent of it too important to be passed over in silence. One great source of chest affections, is the transition from a room, the temperature of which is high, to one that is low, or what is worse, the cold, damp and chilling influences of the night-air to which the system is exposed, whether in a carriage or on foot. The warm atmosphere of an apartment, arising in a great measure from a crowded assemblage, is further aggravated in the effects which it produces on the functions of all organs, by various amusements which excite the feelings and exercise the body, as dancing, singing, lively and animated conversation, and different games. These, conjointly, give rise to those conditions of the circulatory and nervous systems, which constitute the

highest degree of susceptibility to external depressing causes. The distribution of the blood on the surface and throughout the body has acquired more than its summer character: and what renders this susceptibility greater, or much more liable to receive injurious impressions, is, that it has not been induced by circumstances which have long and steadily acted upon the animal economy,—*which impart to the powers of life a somewhat established condition*; but has been the result of temporary causes, consequently the circulatory and nervous systems, though greatly excited, are from the nature of their aroused functions peculiarly exposed to depressing influences from without. It is the activity of the young plant in spring, drawn prematurely into day by the transient gleams of the sun and the warm breath of the westerly breeze.

It must be remembered that these excited vital conditions require a length of time, under the most favourable circumstances, to subside into that state which characterises the system in its comparative repose; and until they have reached this point, there is an unnatural degree of susceptibility which demands no ordinary care.

If we reflect that in all probability the over-heated room, and the stimulating exercises which have been indulged in, have sent to the upper and lower extremities, and to the surface of the body, and kept in vigorous circulation in these regions, blood exceeding by several pounds in quantity what they usually possess,—changes which are a measure of the altered vital relations induced between all organs, it is evident

that the re-establishment of the proper balance of the circulatory and nervous systems, is a matter of great importance to the well-being of the animal economy, where such balance, in all its integrity, is essential to the carrying on of the finely poised or delicately strung powers of life.

Various modes may be adopted for facilitating the establishment of this balance, which has been disturbed by the particular causes alluded to. Warm clothing, if the individual be exposed to the raw night air, is too obvious to need insisting upon. There are circumstances to be attended to on reaching home which may not be equally apparent, but deserving of attention. If the weather be cold, the sleeping apartment should have had the advantage of a fire the greater part of the day: if not requiring this precaution, the bed should be warmed by a tin or stone vessel of hot-water; and port-wine negus, or some other stimulant taken on retiring to rest, will co-operate with these means in protecting the system against prejudicial effects consequent on the transition from a warm to a cold or chilling atmosphere.

We should recommend still further that in the morning friction should be used over the whole surface of the body. It will be a refreshing and invigorating process.

We must again remark that we are writing not for those of robust health, but for a large class less favourably organized for entering with impunity into the active pursuits and amusements of life.

CHAPTER VIII.

CONDITIONS WHICH CONSTITUTE A HEALTHY
SLEEPING APARTMENT.

LXIII. We once remarked to a physician, who lived almost altogether in his open carriage, seeing with what care he wrapped himself up and adjusted his seat previous to taking the reins in hand, that he had clearly studied his comfort. His answer was: *that where a man spends the greater part of his existence should have particular attention, so as to make it as easy and agreeable as possible.*

The reply was excellent, and affords a not unfitting introduction to the subject which we propose to discuss, with this difference, that the condition of a sleeping apartment should be considered less in reference to luxurious ease than to health. The prevailing fault among those who have ample means at command, is, that the former rather than the latter too frequently regulates their conduct. The heaping together rich furniture of various kinds, in a somewhat limited space, and the solicitude displayed in having a bed that shall half bury the body, or that it shall be securely protected against currents, whether from doors or windows, by the accurate adjustment of these, and further by the

tastefully arranged curtains at the head, the foot and the sides of the bed, are, singly and collectively, prejudicial to health in a degree that is not sufficiently apprehended.

Our bodily movements during the day, in some of the results to which they lead, make a striking distinction between us and the productions of the vegetable kingdom. By these movements we are constantly acquiring fresh air. They may be said to be efforts instinctively directed in search of it. The air has to come to the plant, which can take no measures beyond the expansion of its leaves to secure it. During the night, when wrapped in sleep, we are like the plant in its stationary position, and for the just performance of the functions of respiration and of all vital actions, we are indebted to the air that *comes* to us. It is, therefore, important that the air inhaled, under such circumstances, should be purer than that which is breathed during the day; because in the latter case the motions of the body may tend to counteract its injurious effects. In a state of perfect rest, if the air received be deficient in its necessary qualities, there is no muscular exertion by which it may with the same facility be thrown off through a variety of channels; the consequence is, that the blood in the lungs, not undergoing its usual changes, disorders more or less the whole of the animal system.

Numerous morbid effects are to be ascribed to this cause, such as indigestion, a disagreeable taste in the mouth, or sometimes no taste at all—a tainted breath, headache, difficulty or shortness of breath-

ing,—an irritative cough,—a clammy perspiration,—a sense of weariness or fatigue on awaking in the morning,—nervous and spasmodic affections,—thirst and a parched state of the throat and mouth, and other symptoms which necessarily arise from the deteriorated properties of the blood and the general depression of the nervous system.

LXIV. This is no exaggerated picture of the evils consequent on the breathing of impure air, and it is always impure when a sleeping apartment is imperfectly ventilated. Our professional position has naturally made us familiar with the circumstances tending to produce these results.

We have alluded to the plant as furnishing an apt illustration of the conditions of the body during sleep, and the similarity between the two is striking. If the upper surface of its leaves be covered with fine particles of dust, it languishes and dies. As before observed, this prevents the interchange between the elements of the atmosphere and the sap, and the latter becomes unequal to the duties which it has to perform. The whole surface of the human body is the seat of important vital actions. Various elements are constantly passing off, and the external air also exerts a powerful influence upon it. Gases are exhaled and to some extent absorbed by it.

The integrity of these actions is essential to health, and it is impossible that they can be carried on with the required degree of efficiency if the external surface be placed under unfavourable circumstances; among which may be mentioned the soft bed that envelopes the greater part of the body,

keeping it in uninterrupted contact, whatever position it assumes. This prevents the ready escape of the *insensible* perspiration, as well as the necessary influence of the external air upon the skin. The perspiration, which would otherwise be imperceptible, is condensed upon the cutaneous surface and the surrounding covering,—effects which still further aggravate the conditions prejudicial to the powers of life.

Whatever arrests, impedes or unduly excites the functions of the skin must inevitably lay the foundation of disease. Such considerations for comfort and luxurious ease produce these results. We might as well calculate on the vigorous growth of the plant with its leaves similarly circumstanced, as that the animal system can be sound in its operations when its external surface is disturbed in the exercise of its vital processes.

It is not necessary that the bed shall be unpleasantly hard to secure the healthy action of this surface. It is the medium between the extremes which is alone required, and this may be attained by placing a hair-mattress upon a feather-bed; or what is to be preferred, using the patent spring-mattress which is yielding and agreeable whatever position the body occupies.

It must not be imagined that these considerations are trivial or unimportant. To form an accurate idea of their claims to attention, we must reflect on the nature and extent of the cutaneous functions and of their relations to all organs. In the preceding pages we have endeavoured to illustrate these

matters, and have shown, in studying the changes in the distribution of the blood, that every derangement of such functions is the source of a variety of morbid symptoms, and is one of the great inlets of disease under every conceivable form.

Where the constitution is delicate or predisposed to consumption, it is essential that we should maintain *in all their integrity the conditions of the skin*, neither unduly exciting nor depressing its actions; keeping steadily in mind the vital relations which these hold not only with the lungs, but with every organ. Health is the result of the just balance between the external and internal operations of the body.

LXV. The drawn or partially drawn curtains of the bed, is another prejudicial habit. They are a barrier to the free circulation of the air where it is imperatively demanded. They almost virtually shut up the amount which is to last during the long hours of sleep. They prevent the agitation of the air which is necessary to its frequent renewal. Its motion is not promoted by the activity of the body, nor by any other cause; the consequence is, the quantity which is sent out by each soft or scarcely perceptible *expiration*, disturbs so little the limited volume of external air with which it mixes, and being heavier than oxygen or vital air, which is required, that it has not a tendency to ascend from its level, but contributes to form a morbid atmosphere around the body, so that the succeeding *inspiration* draws its supply from this

which is vitiated in its properties and hence unfit for the purposes of life.

The lungs suffer materially from these atmospheric conditions. The chemical changes of the blood are impeded, and consequently this fluid becomes comparatively impure, and inadequate to stimulate these organs to the correct performance of their functions,—these, in fact, are variously disordered. The delicate air-cells receive neither air nor blood possessing their essential qualities,—one inevitable effect of which is, THE CONGESTION OF THE PULMONARY TISSUE, which, in the constitution predisposed to consumption, frequently gives rise to this disease, or facilitates its development, if the germ already exists; and aggravates the structural changes of the lungs if they have manifested themselves.

It is scarcely possible to exaggerate the evils which are to be traced to the air thus deteriorated in its properties. It poisons the springs of life. It undermines the tone and vigour of the whole system. As evidence of its baneful influence, under such circumstances, experiments have been performed to test its capability of supporting animal life, by suspending a bird in its cage at the head of the bed. It has generally been found dead in the morning. Fresh air is as necessary to man as to any portion of the animal kingdom. From the same cause, plants rarely flourish in a sleeping apartment, unless it be large and more than ordinarily well-ventilated. A small and delicate plant, which would not be injurious, would be an exceedingly refined test of the salubrity of the air which is breathed during the

night. Its growth and luxuriance would be an unfailing indication of the purity of the atmosphere—contrary results, of its deteriorated properties.

LXVI. Nothing should be allowed to hang about a bed that in any degree impedes the free circulation of the air; nor should a sleeping apartment contain an unnecessary accumulation of furniture. Whatever may be their description, they present collectively extensive surfaces for the lodgment of fine particles of dust, which is prejudicial to the purity of the atmosphere.

A sleeping apartment should always be so situated as to receive an abundance of light: if from the close vicinity of trees or other circumstances, this is largely or partially intercepted, such a room is always unhealthy. Light is essential to impart to the air which is breathed its vital properties. In winter it is doubly important that this condition should be secured. Nothing more strikingly illustrates the extraordinary influence of light, than the languid and unhealthy appearance of plants from which it has to a slight extent been withdrawn. How quickly they droop and die.

The frequency of the allusion to the vegetable kingdom, in treating of this subject, has throughout a practical application. The animal and vegetable creation are equally dependent on the same external influences. The animal system is as susceptible as the plant of injurious impressions from without, whether they are to be referred to the obstruction of light or the vitiated qualities of the atmosphere. The difference between the two is, that the plant presents

to the mind immediate and palpable indications of disease; while the animal system, in its initial derangement, does not offer symptoms so evident to observation, or if they occur it is not equally easy to trace them to their exciting causes. It is more than probable that these—the absence of light and good air, never once enter into the calculation.

Nothing will so strikingly illustrate the influence of light, as the effects which it produces on the metallic-plate in the Daguerreotype process. The human form, and external objects of every kind, are depicted with an accuracy which is indeed extraordinary. True, the surface of the plate is chemically prepared to receive the delicate impressions of the rays of the sun; and the knowledge of this fact, with the unreflecting multitude, tends to diminish the marvel which it ought to excite, and to keep out of view the ever active and pervading agency of light. Everything, whether animate or inanimate, has its sensitive surfaces prepared by the hand of nature, on which light is perpetually acting, and variously modifying the qualities of matter. The human frame is as susceptible as the surface of the metallic-plate to the impressions of light, and had we the means of accurately analysing its influence, we should trace this in the altered and improved conditions of every molecule entering into the constitution of the body.

LXVII. The injurious effects arising from the absence of good air and light, and invigorating exercise, are exhibited in the diseases to which animals are subject, confined in such places as the Zoological Gardens: they are constantly dying of consumption. A scrofulous

character of the system is produced—the nature of which is a deficiency of vital action which gives rise to tubercles in almost every organ.

LXVIII. There are further considerations bearing on the important subject of ventilation. It must be understood that we are writing for the delicate or those predisposed to phthisis; and, therefore, if any of our remarks appear trivial or unnecessarily minute, it must be kept in mind that the requirements have a practical application to those whom we specially address.

In winter the sleeping apartment must be both warm and well ventilated—conditions which are not always of easy attainment. Nothing is more prejudicial to health than the chilling atmosphere of such room, at this season, and the cold and damp state of the bed-clothes. They are invariably damp, if measures are not employed daily to prevent or correct the deposition of moisture.

A person leaves for the night the warm and comfortable fireside, and a room, the temperature of which is, perhaps, 60° or 65° Fahr., to enter one and to remain in it many hours, without the slightest bodily exertion, the temperature of which often averages from 30° to 35° . The animal system, feeble in its energies, cannot with safety pass from the one extreme to the other. The transition is too abrupt to allow the vital powers to adapt themselves to such uncongenial circumstances. The extremities and surface of the body are chilled, and the blood is driven from them to disturb by its presence the internal organs, delicate and susceptible of depressing influences.

The only perfect and unobjectionable mode of warming apartments, *is by the uninterrupted circulation of hot-water*; and those who have the means to secure this invaluable comfort — it would be incorrect to designate it a luxury, because it directly contributes to health—should on no account neglect it. There are few objects to which their wealth can be more advantageously applied. This, however, is only within the command of the few, and, therefore, we must consider what other methods can be used to attain in some degree the end in view.

The next plan which suggests itself, is keeping a fire during the day in the sleeping apartment, and allowing it gradually to die out towards the time of retiring to rest; or what is preferable, is an extremely small stove, consuming cinders, either an Arnott or on the principle of the Arnott stove, which may be kept in efficient operation during the twenty-four hours at the cost of the merest trifle.

In these remarks we have considered only the production of heat. There is another condition which must be annexed to it, *viz., the ventilation of the apartment*, otherwise the heated atmosphere will be prejudicial. The entrance of air through ill-fitting doors and windows, or its exclusion from the accuracy with which these are adjusted, are open to obvious objections. The air which is introduced into a room through such various apertures, from the level of the floor, upwards, creates a variety of currents, playing between the door and the window, or the chimney, and hence a person sometimes finds in the morning that he has caught cold—has a stiff

neck, or a rheumatic affection,—evils from which we have suffered ourselves frequently. A recent invention, by a scientific and philanthropic gentleman, will allow us to have fresh air without these serious objections. He justly observes in his remarks on the instrument :

“The air in chambers, and other interiors, where people assemble is considerably rarefied by bodily heat, by respiration, by fuel or candles in combustion, and by other causes. The forcible rush of air through the key-hole of a closed door of a heated room, is another familiar illustration of aerial movement. As the air at the upper part of a heated room is more rarefied than the air below, the rush of air through an aperture above will be *more* forcible than through a similar lower aperture.

“A vessel cannot be fuller than full ; if there is evidence *palpable to the senses* that there is a constant entry of air from without, to the heated chamber within, *deductive evidence* is afforded of the continual removal of internal air. The air removed from within is vitiated air.

“From the foregoing premises it *might* be reasonably conjectured, that the following contrivance would be efficacious for the healthy ventilation of all internal places of assembly ; the effects here made known *prove*, it is believed, that it is so.

“The ventilator contrived by Mr. Sheringham is as follows :—A flap, with quadrant ends at right angles to it, is constructed to fit into a frame in the form of a parallelogram ; to each lower corner of the

flap is a pin, which pins work in corresponding sockets at the lower corners of the opening of the frame. The flap, by mechanical arrangements, is susceptible of being thrown outward to an angle of about sixty degrees, or pulled up to any less angle, or the opening may be entirely closed by the flap, when it is desired to do so: one line for the regulation of all the above operations is brought within reach of the hand.

“The flap proposed for a room about ten feet square is about nine inches long, by about three inches deep, working in a suitable frame.

“A perforation is to be made in an external wall, fully as large as the ventilator, the upper part of which should be from four to eight inches below the ceiling of the apartment to be ventilated. Mr. Sheringham's ventilator may then be fixed in the opening from within, so that the flap of the ventilator, when pulled into the frame, may be on the same plane as the inner surface of the wall. The whole face of the ventilator may be papered or painted in the same manner as the piece of wall which is removed for its introduction, but so that the flap may fall freely within the room whenever an inlet of air is desired. If the dimensions or nature of the interior to be ventilated requires a larger opening than can be externally closed by an air-brick, or if the position of the building to be ventilated appears to demand an especial provision against the entrance of soot or other natant substance in the atmosphere, an iron frame, covered with perforated zinc, or gauze

wire of adequate fineness, may be substituted for the air-brick. The size and number of the ventilators will be regulated by circumstances.

“It will be found that the oblique direction which is given to the flap of the ventilator, when opened, will induce an upward direction to the incoming current of air admitted by it, and that this upward direction will be retained a sufficient length of time to enable it to become warmed, and dispersed through the warmer air within the apartment before it reaches the occupants, and hence there will be removed from such incoming current of air, in sufficient time, all the injurious characteristics and tendencies of a cold current of air frequently, and *frequently severely*, felt from an open window; the ‘Sheringham Ventilator’ will therefore remove all the objections arising from a *descending supply of air.*”

The cost of the instrument is only a few shillings and cannot possibly get out of order; and it may be adjusted to admit different quantities of air according to existing necessities. Where it is introduced the doors and the windows should be made to fit accurately so that fresh air shall enter only through one channel.

The advantages which this invention presents may be explained in few words. The air comes in on a level with the ceiling and passes along the whole surface of it, diminishing gradually in the strength of its current as it recedes from the external opening; and so imperceptibly does it *descend*, that a lighted candle held a few inches from the ceiling scarcely indicates the slightest disturbance in the

stratum of air at that level. It does descend, but never so as to be felt, except from its agreeable freshness, displacing in its slow and uninterrupted descent the impure air arising from the process of respiration.

There is a phenomenon connected with this invention opposed to the received principles of physics; but which is satisfactorily established by experiments. That cold air should enter a room, the temperature of which is ~~lower~~ than the medium without, is a fact with which every one is acquainted; but that the air of the room SHOULD MAKE ITS EXIT BY THE SAME CHANNEL THAT ADMITS THE FRESH, is altogether at variance with the prevailing ideas on the laws which are supposed to regulate its diffusion. It does from time to time make its exit through the *external* opening, as may be satisfactorily proved by the deflection *outwards* of the flame of a lighted candle, and occasionally to as great an extent as it is deflected *inwards* by the current of fresh air.

higher

This invention is the only one which removes the acknowledged objection to the use of the Arnott stove in rooms, the doors and windows of which are generally closed. It furnishes the required supply of fresh air, and allows the escape of air no longer fit for the purposes of life. It is equally applicable to all apartments which are warmed by the open fire-place, care being taken that air shall enter from without through no other channel than that which is afforded by the instrument.

It is sometimes objected to measures which maintain an agreeable degree of warmth in apartments,

that they render the body proportionately susceptible of external depressing influences. This is a mistake. The body is never so capable of resisting these as when its functions are performed with correctness and vigour,—conditions which a necessary degree of warmth, conjoined with proper ventilation, tend invariably to promote.

LXIX. If from various circumstances none of the foregoing means can be adopted to give warmth to the sleeping apartment, there is one expedient which is within the reach of all, and one that should never be neglected by those of delicate constitution, whether young or old. An earthen or tin-vessel, filled with hot-water, should be placed between the sheets, in the middle of the bed, about *two hours* before the person retires to rest. This thoroughly removes all dampness, and prevents the surface of the body from being chilled. It may be retained until the feet of the individual be thoroughly warmed, but it should then be removed.

LXX. In the foregoing remarks, we have chiefly considered those circumstances which constitute the healthy conditions of a sleeping apartment in winter. It is now necessary to say a few words in reference to what is proper to be attended to, in order to secure the same conditions during the hot and oppressive days of summer. We have not to study how to produce an agreeable degree of warmth, but how to moderate the heat from without, so that its influence shall not be prejudicial to the system. This is principally to be attained by perfect ventilation. The apparatus previously described, is ad-

mirable for this purpose. We have it adapted to our own sleeping apartment and can speak in the highest terms of its efficiency.

The doors and windows of the bed-room, at this season, should be left open during the day, but the windows rarely at night. Though the heat of the day may have been great, it frequently happens, in our climate, that the nights are comparatively cold and damp. The bed-clothes should invariably be left exposed, during the day, to the influence of the fresh warm air of the room. They necessarily become damp from the inevitably increased perspirations and exhalations from the body, and hence unhealthy unless such a condition be corrected. It is also advisable that a sleeping apartment, in summer, should have less furniture—a less accumulation of luxurious conveniences, comforts, or ornaments, than in winter. They are receptacles of heat, and are constantly giving this out at night, imparting to the air which is breathed a temperature which is oppressive and enervating. They obstruct also the thorough ventilation of the room. The greater part of the carpeting should be removed. It is objectionable on several considerations. The walls of the apartment should be frequently swept, if white-washed or coloured;—and cleansed, if painted or papered. An attention to these and similar matters, is essential to secure the healthy conditions of a bed-room at this season. Chloride of lime, in the proportion of one to three of water, may occasionally be used with great advantage. Exposed in shallow vessels, or sprinkled on the floor every few

days, it corrects the effluvia arising from the body,—effluvia which rest on every article of furniture, and renders the air much fitter for the purposes of animal life. The shower-bath, at this season, should not be neglected, always taking care that it is followed by friction with the flesh-brush.

It may possibly be imagined by some that these are unnecessary details,—conditions not imperatively required to promote the vigorous and natural actions of the animal system. Nothing can be unnecessary that tends to secure health; and no efforts should be thought trivial or unimportant that contribute to this result. The body, it must be remembered, has its acute susceptibilities of a variety of impressions which we cannot accurately appreciate or measure. To these, however, it has the sensitiveness of the prepared metallic-plate to the action of light; and, therefore, where the vital energies are feeble, it is our duty, whether in reference to ourselves or others, to endeavour to ascertain what is calculated to correct disease, or to give tone and vigour to the body. Such inquiry necessarily includes everything that affects directly or indirectly the properties of the air which is breathed, or the condition of the vital powers the aggregate of which constitute life.

We are fully conscious that efforts, and often extraordinary efforts must occasionally be made to acquire health—to guard against or mitigate disease. It is this consideration which suggested the present physiological researches; nor have we, in the prosecution of them, exhausted the subjects brought under notice. We have only glanced at their most salient

points, bringing such prominently into the foreground as were likely to interest and to be of practical value to the general reader. We have skimmed lightly over the wide field of vital phenomena.

CHAPTER IX.

CONSIDERATIONS IN REFERENCE TO THE FEMALE
CONSTITUTION.

LXXI. IN studying the causes which excite or predispose to consumption, certain conditions belonging to the female constitution suggest the propriety of a few remarks. Woman is more delicately organized than man. Her health frequently hinges on circumstances of which the latter is independent. She has her peculiar functions, as important in their influence on the vital powers generally, as they are for the accomplishment of the end for which they were designed. The disturbance of these functions is one great source of disease.

The character of the female constitution through life, is influenced more or less by the manner in which the organs exercising such functions, perform their office at puberty as well as long afterwards. When the animal system is feeble in its energies, which it frequently is in those predisposed to consumption, these organs are only partially excited or are tardy in their development, the evidence of which may be traced in various unequivocal signs. On the activity of them depends largely the distinguishing forms of the female figure. It diffuses an influence

through every fibre of the body, causing the growth and enlargement of external parts, which by the mysterious laws of sympathy are in intimate connexion with these organs. When these fail, at the proper period of life, to exercise their functions, or for years inadequately discharge their office, the mammæ are generally imperfectly developed,—the chest is flat instead of displaying its usual fulness; the complexion is sallow or of a pasty expression; the pulse is small and weak;—and in fact the symptoms which frequently manifest themselves *indicate a deficiency of vital energy.*

This is almost an inevitable effect flowing from the arrested or disordered uterine functions; and it is worthy of attention, as it creates a predisposition not only to numerous affections, but especially to consumption where the slightest tendency to it exists.

LXXII. The inactivity or non-appearance of these functions, at puberty, or at a later period, should always be a source of anxiety, because it is a condition which is incompatible with health. The system should never be considered at all safe from the inroad of insidious and distressing forms of disease, not springing out of the ordinary circumstances exciting morbid action, until such functions are established in all their integrity. The solicitude to effect this should cease only with the accomplishment of the object. The preventive measures against consumption, which have been considered in the previous pages, are peculiarly calculated to arouse the functions of these organs. All kinds of exercise in moderation,

generous and substantial diet, and the regular use of friction over the whole surface of the body, are among the most efficient remedies co-operating towards the attainment of this end. Of these, however, friction is by far the most valuable. It should be employed, morning and evening, for twenty minutes or half an hour, particularly along the spine and over the abdomen.

From the spinal cord the internal organs draw their copious currents of nervous energy, in virtue of which they are enabled to perform their important offices, and *hence the more extensive the relations established by such external means between the lungs, the heart, the stomach, the liver, the bowels, the kidneys, and the uterus, and that column of nervous matter designated the spinal cord, the more healthy and vigorous will be the functions of life.*

The application of friction inevitably multiplies these relations, because it gives to the nervous media by which they are connected a wider range of vital activity. And it must further be remembered, that every change which is thus induced in the condition of the nerves and the nervous column, with which they are associated, is always accompanied with a corresponding modification in the properties and motion of the blood, not only in the organs directly stimulated by the friction, but throughout the animal system. There are no measures of equal efficiency to this. There are none which so safely, promptly, or to the same extent, influence the vital powers.

LXXIII. It is from these and other physiological considerations, that we unhesitatingly recommend it at

puberty, and at succeeding periods of life, when the functions of those organs peculiar to the female sex have not yet appeared, are inefficiently exercised, or are altogether arrested. It is scarcely possible to exaggerate the good which its steady application is capable of producing in the general tone of the constitution. There are other means with which it may be advantageously conjoined. After the body has been rubbed for a quarter of an hour, the shower-bath may be used with great benefit followed by friction.

The shower-bath, in delicate constitutions, frequently depresses the vital actions on the external surface, giving rise to feelings of discomfort rather than an agreeable glow, which is a sure indication of its salutary influence; but such depressing effect, and its injurious consequences are prevented by the friction previous to the employment of the bath, as well as by its use immediately afterwards.

The friction prepares the surface for the beneficial action of the water. The good with which this is fraught, *is to be accurately measured by the amount of the vital activity excited on the surface of the body.* Why is this a measure of it? Because such activity is itself a measure of the quantity of blood brought to the surface, as well as of the extent of nervous energy correspondingly influenced. Such changes in the nervous and circulatory systems, we have previously shown impart new life and vigour to all parts of the animal economy. All are links of one vital chain, and hence to act powerfully on a large series of these on the surface of the body, is to affect

the condition and relations of every organic molecule.

LXXIV. We do not derive from the shower-bath a tithe of the good which it is capable of conferring, from neglecting the use of friction previous to and subsequent to its employment. The shower-bath is not always a safe remedy;—it often depresses in place of arousing the vital actions, particularly in those of delicate constitution for whom it is generally prescribed. We hesitate not to say that where it is indicated, important beneficial results may be calculated upon with certainty, if friction has preceded and followed its application in the manner recommended. This renders it at all times a safe and salutary measure.

In considering the consumptive predisposition in the female, and the causes by which it may be aggravated or induced, the disordered action of the uterine functions claims more than ordinary attention. To prevent the manifestation of phthisis, where the tendency to it prevails, the means employed must have *a general and a particular reference to the condition of these functions*. Without their healthy cooperation the difficulties of the undertaking are greatly multiplied. Nor should we rest from our efforts until we have established them in all their integrity. With their assistance we can effect important changes in the tone and vigour of the animal system. The organs by which they are exercised, are centres of extraordinary vital influence, and from the stimulus which they impart to the powers of life, are capable of modifying the condition of every

organic fibre. The brain, the spinal cord, and every nerve, for the full and natural display of their powers, depend on the accuracy with which these functions are performed.

Therefore in the employment of measures to correct the consumptive predisposition, we must not lose sight of the fact, that this is often induced by the derangement of the uterine functions, and facilitated in its development by their tardy manifestation at puberty—by their sudden interruption, and other conditions of them. Whatever amount of success may follow from the remedies enforced, this is never to be regarded as complete or satisfactory, as long as these functions are arrested or exercised in a degree inadequate to the necessities of the animal economy.

LXXV. It may probably be imagined by some that we have exaggerated the beneficial effects of friction. We have explained the manner in which it influences the powers of life, and in far greater detail than has been attempted by any preceding writer. We are not acquainted with any work that treats, at length, of the nature of the vital relations between the external and internal surface of the body—tracing these relations in the successive changes induced in the properties and motion of the blood, and in the altered conditions of the nervous system. We have endeavoured to give to the physiological principles developed a practical application, with what success it remains with others to determine. We have conscientiously executed the task which was self-imposed, but cheerfully undertaken

from the conviction of its importance ; and however much we may have failed to convey to others, in simple and intelligible language, sound information on the subjects brought under notice, of this we are certain,—and there is no presumption in the statement, that we shall awaken an interest in inquiries of this kind, which have hitherto received comparatively little attention from the scientific practitioner, the best calculated to pursue them in their elaborate details, or from the public at large. To the latter these remarks are addressed, and we hope not unsuccessfully. We have treated of remedial measures, requiring in the cases in which they are shown to be applicable, no professional knowledge to direct or regulate their employment, beyond an observance of the rules which have been laid down.

Since these pages were written, we have been favoured with the observations of one of the first philosophic writers of the age, on a treatise which we have recently published.* He says, “ Nothing pleased me more in the whole work than your remarks on the efficacy of friction. For a great number of years I have entertained similar views, and have practically employed it with unfailing benefit. . . . I was confirmed in this practice by a passage I met with two or three years ago in the Life of Lord Teignmouth. I may have mentioned it to you before, but as it is so striking a corroboration of your views, I have copied it out for your edification.” The following is the extract :—

* THE NATURE AND CURE OF CONSUMPTION, INDIGESTION, SCROFULA, AND NERVOUS AFFECTIONS.

“The recipe which Lord Teignmouth found an effectual substitute for medicine, and also for horse-exercise—which, from motives of necessary economy, he had been obliged to discontinue—was very simple, and having contributed materially to the remarkable renovation of his constitution during the latter years of his life, deserves mention. It consisted exclusively of the use of friction, applied to the region of the liver and stomach for an hour before he rose in the morning; and he employed as his instrument only the fleshy part of his arms. He now gradually laid medicine aside; and exhibited with no small satisfaction the empty shelves of a cupboard, which were previously laden with his phials, commonly called by his family *his household gods*.”

Lord Teignmouth himself says of the plan, in a letter to Dr. Cornish, “this happy alteration in the writer’s health, is owing to a system which I have regularly followed, and which has so wonderfully restored my shattered constitution.”

