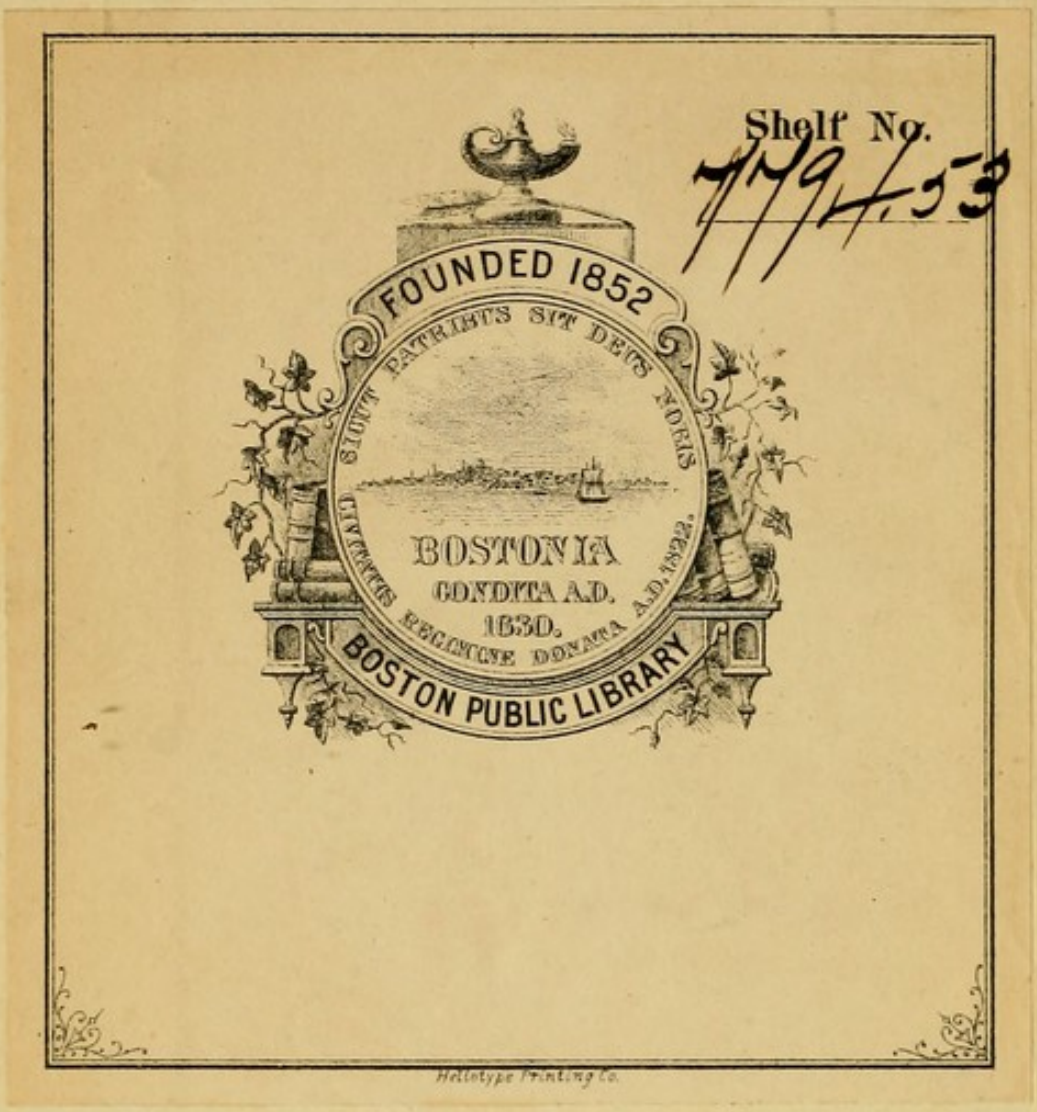
An inquiry into the influence of situation on pulmonary consumption and on the duration of life : illustrated by statistical reports / John G. Mansford.



AN

INQUIRY

INTO THE

INFLUENCE OF SITUATION

ON

PULMONARY CONSUMPTION,

&c. &c.

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ON

PULMONARY CONSUMPTION,

AND ON THE

DURATION OF LIFE.

ILLUSTRATED BY

STATISTICAL REPORTS.

BY

JOHN G. MANSFORD,

MEMBER OF THE ROYAL COLLEGE OF SURGEONS OF LONDON.

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Preface.

THE substance of the following pages was first written for insertion in one of the Medical Periodical Publications; but enlarged views of the subject, and additional facts, extended it beyond the ordinary limits of that species of composition, and induced the author to alter his original plan, and to give his paper its present shape. But a more important consideration fixed him in this resolution. The error (if it be such) which it was intended to expose, belongs to both the physician and the patient; and to accomplish the object desired, the inquiry must be rendered accessible to both.

It does not appear that the choice of situation for a consumptive patient, unless with a view to

mildness of temperature, has been considered of much consequence; provided it were one of those which fame as reputed healthy. The patient, to whom this remark principally applies, perhaps, deems any advice on so common a matter unnecessary; and the nearest situation of this description will be the one resorted to. Neither can it be said, except with the view above-mentioned, and in the parallel one of change of climate, that medical authors have been much more precise in their instructions on this subject. They have for the most part directed, that a situation enjoying a pure and salubrious air should be made choice of: but in what this supposed salubrity consists; or whether it is equally adapted to every variety of disease, they have not stopped to inquire. Situations which have been famed for the longevity of their inhabitants, have been very generally selected as the most favorable for the recovery of the sick: but what a fatal error this may lead to, with regard to the consumptive, will be seen in the course of the following treatise. It will also, it is hoped, appear evident, that the choice of situation for patients of this class, is a matter of considerable importance. The prac-

titioner should be in possession of fixed and certain rules to guide him in his instructions on this point, and he may expect a more ready and early acquiescence on the part of his patient. The sick should be left to their own discretion in nothing. The consumptive especially, at all times slow to perceive the real nature and tendency of their malady, may with difficulty be persuaded to adopt the measure of removing to a more favorable situation, before it be too late : — or if left to their own inclinations, or the guidance of popular opinion, may, in removing, commit a fatal error.

It is on facts connected with statistical medicine that the selection of the most salutary situations for different forms of disease must be grounded. Facts of this nature have already extended the boundaries of medical science ; but they are still very defective. Much information of an interesting and valuable kind, remains for the research of the curious, and from which the sufferer under many forms of chronic disease may reap advantage. In offering a small contribution towards this desirable end, the author has to regret that it is so limited : but the fault of its

limitation does not rest with him. Numerous inquiries have been made which have failed to produce satisfactory replies. Many medical men are not in the habit of keeping case books; and in some populous districts, the different parishes are so intersected by different practitioners, that it has been found impossible to collect accurate reports of the mortality from any distinct disease.

These defects can only be remedied by an act of the legislature. If a certificate were required of the medical attendant of the cause of death, to be delivered at or before the time of interment, for insertion in the parish register,—so that the age and disease of all who died in every parish might be obtained by a reference to its books,—a record of facts would be established, valuable beyond all which the medical or philosophical inquirer has now access to. To render this stock of information still more valuable, some of the most striking localities of each parish should also be recorded; as soil, elevation, the results of meteorological observations, &c. The soil and elevation might be obtained from surveys already made, or by others appointed for the purpose. A

meteorological journal might be kept by any intelligent resident, who might be furnished with instruments for that purpose by the parish; to which, if required, a small gratuity might be added for the trouble.

If something of this kind had been adopted in different countries, we should be at no loss to determine the fittest situation for the consumptive. "But as the preservation of mankind has never been judged worthy of those grand, systematic measures which have been incessantly employed for their destruction, we do not possess a proper stock of comparative knowledge." In the absence of such knowledge, and as the result of the following inquiries, it appears probable that we possess in our own country (if comparative exemption from the disease can entitle them to such a distinction) situations as favourable for the residence of those labouring under pulmonary consumption, or predisposed to it, as any of those so highly boasted of in the more Southern parts of Europe. And it is earnestly to be desired, that those practitioners who reside in situations possessing the required local advantages, would take

pains to collect and to publish such information, as may throw additional light on a highly interesting inquiry. Medical societies at their occasional meetings, may be able to collect from their different members assembled from an extensive and varied surface, much local and comparative information. The author's connection with a society of medical practitioners, extended over a district admirably constituted for such an inquiry, has given him additional facilities of prosecuting it with effect: and to the liberal communications of these gentlemen he is greatly indebted for the success which has attended it.

With respect to the second part of the following treatise, it is an extension of the same course of inquiry as that pursued in the first; from which it receives, and on which in its turn, it reflects, illustration and support. It equally concerns the aged, the constitutional invalid, the convalescent from acute disease, and the calculator on the probabilities of human life.

Frome, July 25, 1818.

PART I.

ON THE

INFLUENCE OF SITUATION

ON

PULMONARY CONSUMPTION.

PART I.

IN a disease so frequent in its occurrence, so fatal in its result, and which excites so deep an interest, on account of the age, and character, of those who most commonly become its victims as pulmonary consumption, no inquiry which has for its object the acquisition of enlarged views of that disease, or of the means by which it is to be obviated, or removed, can be deemed unimportant. The following observations are designed to call attention to the effect of local situation on pulmonary complaints; and more especially to ascertain, how far they may be supposed

to be influenced by increased, or diminished atmospheric pressure. The question is new, and if the reader should think it too hypothetical to wear a very promising aspect, he is requested to suspend his judgment, till he has heard the evidence upon which it may be rightly formed.

Before entering further into the subject as connected with pulmonary consumption, it may be right to prepare the way by adverting to the opinions of others in any way allied to it. There are I believe but few authors who have ventured to place the mechanical changes in the atmosphere, amongst the causes of disease. Doctor Cullen has mentioned a sudden diminution in the weight of the atmosphere, as one of the exciting causes of hæmoptysis: but this remark led the way to no further observations, nor to any practical directions on the subject of hæmorrhage; nor was it conjectured to be in

the most remote way connected with the causes, and phenomena of phthisis pulmonalis. I am not aware, that amongst the causes which have been assigned, as those which sway the local, and comparative prevalence of this disease, the mechanical influence of the atmosphere has ever found a place. Whether it has any just title to such a distinction, the facts which I have to adduce, aided perhaps by further inquiries, must determine. Sir John Sinclair has pointed out both the principle and its application, as relates to Hæmoptysis; and recommends flying to a "flat or deep country where the air is heavy."* Doctor Johnson in a recent work† observes, that "on many constitutions, and particularly on people denominated nervous, certain barometrical changes in the atmosphere have a remarkable effect. Thus when the glass is very low, the

* Code of Health and Longevity p. 32.

† Influence of the atmosphere on the health, &c.

wind southerly, and a storm impending, such a sense of sinking weakness, tremor, and dejection is often felt by valetudinarians, that they are quite miserable till the equilibrium of the atmosphere is restored, when all their morbid feelings vanish "into air—thin air." But with the highest respect for the opinions of this elegant writer, I am compelled in this instance to dissent from him; and to attribute the distempered feelings which he describes, not to the diminished weight of the atmosphere, but to the "southerly wind," and "impending storm," and probably to some electrical changes accompanying them; which would produce similar feelings, whether the barometer be high or low. It is hoped that this may be satisfactorily elucidated in the course of the following pages:—but it may in the mean time be observed, that from long habits of watching the effects of barometrical changes on health, and disease, I am enabled to state with confidence, that, although the

glass be unusually low, if the air be at the same time clear, and temperate,—no such feelings as those above described, are felt by the majority of valetudinarians.

Doctor Reid has strongly opposed* the preceding hint of Doctor Cullen, and laboured to establish the doctrine of hæmorrhage upon the Brunonian hypothesis of excitability. "Were the fluids," says Dr. Reid, "circulating through every minute part of an animate body, affected in a similar manner to mercury contained in the tube of a barometer, existence would not merely be supported by a tenure extremely precarious, but the qualities of life would cease to be displayed." This is undoubtedly true: the motions of the mercury in the tube of a barometer are purely passive; while those of the living body are actuated by a moving principle within: but

* Treatise on Consumption, p. 77.

notwithstanding this property of life, it is equally certain, that these motions may, and do become languid, or excessive, in proportion to the existing force of the moving principle itself, and the resistance opposed to its actions; and instead of saying that "it is in all instances through the medium of the *excitability* that external powers operate upon living existence," I should say, if not in all, it is in the greater number of instances, through the medium of mechanical or chemical agency that external powers operate upon living existence. Every form of disease, may be considered as a temporary superiority, acquired by external causes, over the internal and controling powers of life; and death and subsequent decomposition, as a total surrender on the part of the vital and individual powers, of their machine the body, to the operation of the universal laws of nature. The effect of chemical agencies on the living body, requires no illustration here: and to say that it is

placed above the operation of mechanical ones, is to refuse instruction from the plainest evidence of our senses. Where is the sovereign power of life when the vessels of any selected surface of the body, may be made to expand, and even to burst, by the removal of the mechanical resistance of the atmosphere? Why do nasal polypi, and other vascular tumours dilate upon atmospherical changes? And why do we sometimes in conformity with the instructions of Dr. Reid himself, contained in another work,* unload the enfeebled vessels, to remove a portion of the mechanical resistance to their freedom of action? This objection of Dr. Reid can weigh but lightly against the dominion of facts. I have only noticed it, that I may not appear to have wilfully shut my eyes to the opinion of a respectable author; and that the question

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* Essays on Hypocondriacal and other Nervous Affections, Ess. 22.

proposed, viz. how far diseases of the lungs, and especially consumption, may be supposed to be influenced by increased or diminished atmospheric pressure, may remain free for unprejudiced inquiry.

There has always existed a great discordance in the directions given to consumptive patients, for their choice of air and situation. By some they are directed to a high situation,* where the air is pure and dry:

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* Amongst those who have recommended such a situation, the high authority of Dr. Darwin must not be passed unnoticed. In the third volume of the Zoonomia the case of a physician (the late Dr. Currie of Liverpool,) labouring under pulmonary consumption is related; who after various changes of place, made the greatest progress towards amendment at the village of Moffat in Dumfriesshire, situated about 300 feet above the sea. From this circumstance, he does not hesitate to recommend an elevated inland situation as the best adapted, under certain circumstances, for consumptive patients. But not to say that such a hasty inference from a solitary case was unworthy of the author of Zoonomia, the

by others a low and moist one, but this more for shelter and uniformity of temperature, than from the view I am about to take of the subject; by others again, the sea side is recommended. But nearly all agree in the superior advantage to be derived from a free, and pure air; and in this general direction, popular opinion fully coincides. It has however been asserted by some respectable authorities, that low and moist situations, especially those where intermittent fevers are endemial, are unfavourable to the production of consumption; and by parity of reasoning, that

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patient was improving when he arrived at Moffat; and there were besides, other circumstances which had their share in contributing to his recovery; amongst which were, the advancing season of the year, and a steady perseverance in almost incessant exercise in a carriage or on horseback.

Dr. Johnstone, after practising more than thirty years at Moffat, says, expressly in a letter to Dr. Garnet, that the symptoms of consumptive patients were generally aggravated during a residence at that place.

such situations were best adapted to its removal where it already exists. Doctor Wells has supported this opinion in the third volume of "Transactions of a Society for the improvement of Medical and Chirurgical knowledge." Sir James Macgregor, in his observations on the diseases of the army in Portugal, also gives his testimony to the same effect. Dr. Harrison, whose situation afforded peculiar opportunities of observation, says, in an address to the Medical Society of Horncastle, in Lincolnshire, that idiopathic consumptions which were frequent in the wolds of that county, were seldom found in the fens; which he attributes to a difference in the component parts of the air in those situations. This observation was confirmed by Mr. Wayet an experienced practitioner at Boston. Dr. Harrison also asserts on the authority of Mr. Boucherett, M. P. for Great Grimsby, that consumption is a rare disease in Holland. We have also the testimony of Doctor Cogan, who

resided several years in that country, that consumptions were much less frequent than in England. These concurrent testimonies, to others might be added, would appear sufficient to establish as a fact, that air impregnated with moisture, or with different effluvia, or miasmata, by which its purity is lowered, is rather favourable to pulmonary consumption than otherwise. But air answering to these conditions, is for the most part, only to be found in low situations; where the increased density of the atmosphere, and the resistance offered by it to inordinate action of the vessels, especially of their extreme branches, may be supposed to have a share in the beneficial effect.

These facts strong as they are, may fail to produce a general conviction of the advantage of low situations in consumptive complaints. The tide of popular prejudice sets full against it, and the medical adviser must

be prepared with substantial arguments when he proposes to his patient a removal to such a situation. His friends will perhaps consult only convenience in removing for a change of air, considering every change as alike:— or, they will be guided by what has been said to be the almost universal popular opinion on this subject:—or they will, perhaps, consult their system of domestic medicine; where they will be directed, if living in a town, or close situation, to quit it as speedily as possible, and seek a free, and pure air, to obtain which, an open, and perhaps an elevated situation will generally be selected: while the patient himself knowing enough of his disease to consider it as a decay of the lungs, shudders at the idea of a low situation, and fancies that he will not have air to breathe. But the difficulty does not end here. Almost every county, or indeed every neighbourhood of much smaller dimensions, has its Montpellier, some favoured spot celebrated from

time immemorial for superior healthfulness and salubrity; terms of vague import, when meant to apply to every species of bodily distemper. To these situations, the victims of chronic disease indiscriminately resort, with equal expectations of recovery: and thither will our consumptive patient fly, with the same hopes, although it may be the very worst place he could inhabit.* If the medical

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* A remarkable, though by no means a singular instance of the obstinacy with which consumptive patients continue to resort to places, which years of fatal experience have proved to be prejudicial, may be found in a communication from Mr. Archdeacon Blackburn to Dr. Percival, published in the 65th volume of the Philosophical Transactions. Speaking of Richmond, in Yorkshire, he says, "The air seems peculiarly unfavourable to consumptive disorders. Many strangers come hither from different parts, in the first stage of phthisis pulmonalis; but after thirty-five years of experience, I may truly say that not one has recovered, although the utmost care has been paid to their respective cases." In a short sketch of the medical topography of the same place, given in the first volume of the Medical Repository, it is stated to be very elevated, and

attendant is consulted in the matter, he will perhaps not think it necessary to enforce any particular situation, or will content himself with recommending some place of general reception for these unhappy sufferers, as Clifton. If others are consulted, it may happen, as I have more than once known to be the case, that a different situation may be recommended by each: one advising the sea side, another a low and marshy situation, and a third a high and dry one. Amongst these conflicting opinions, the patient and his friends are still left at

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particularly obnoxious to phthisical patients, but in other respects very healthy. Dr. Southey who has quoted the above observation of Mr. Archdeacon Blackburn in his Treatise on Consumption, adds in a note taken from the *Dict. de Sciences Medicales*, that "It is a well known fact, that upon the Hill of Montmorency, near Paris, which is dry and sandy, and exposed to a very keen air, patients with ulcerated lungs suffer very much, and find their disease aggravated, and rendered soon fatal; whereas almost all other patients, especially *les cachectiques* find singular benefit there."

liberty to choose a situation for themselves; which, if there be any truth in these remarks, will, in nine times out of ten, be a wrong one.

Whether an accelerated circulation be considered as the cause, or effect of the diseased actions which give rise to pulmonary consumption, it is not necessary to inquire. It is sufficient to know, that such a state of the circulation is incompatible with any amendment in the diseased state of the lungs: and the first, and most important indication in the curative means to be employed, is to remove or to retard this morbid acceleration, especially in the lungs; and it appears that such a state must be considerably influenced by increased or diminished atmospheric pressure: and that by keeping this fact in view, in our choice of local situation for patients thus circumstanced, we possess additional means for furthering the indication required.

The sensations experienced by aeronauts, and by those who have ascended high mountains, may throw some light on this subject. These sensations have been described as occasionally resembling those of intoxication. At others, great lightness and agility have been experienced, but soon terminating in weariness; hæmorrhages from the nose and lungs; sickness; difficulty of breathing, and hurried respiration on the slightest exertion; a quickened pulse; painful distension of the eyes and ears, and palpitation of the heart. Doctor Halley relates of himself that he experienced very painful feelings on ascending from a great depth in a diving bell; the circulation not being immediately able to accommodate itself to the sudden removal of so great additional pressure.

The effect produced on animals, and parts of animals, in air of still greater rarity, may throw additional light on our subject. Mr.

Boyle in his experiments with the air pump, related in the philosophical transactions, having placed the heart of an eel in the exhausted receiver, observed it to grow tumid, and to beat more swiftly than before. The bodies of living frogs and vipers were observed to swell prodigiously in the vacuum, and many other animals to pant and breathe quickly: and we all know what happens in the common operation of cupping. In so great expansion of the fluids, the force which the vessels must have to sustain, may readily be conceived; especially the superficial ones; and as such in this view of the subject, the vessels of the lungs must be considered.

It may be supposed, that although the elevated summit of a high mountain, or the vacuum of an exhausted receiver, produce such remarkable effects; the comparatively trifling variations in the habitable surface of the earth, cannot produce a sufficient change in the

constitution to merit a serious consideration in the treatment of disease:—but it will not, I trust, be difficult to demonstrate, that this opinion is erroneous. The difference of elevation in two situations not far removed from each other, is often much more than would be suspected. A rise of several hundred feet may be so gradual, as not to be apparent in the general outline of the country. The effect of such a difference, is perhaps more immediately conspicuous in the subjects of asthma, than in those of any other disease. It is no uncommon thing to hear patients afflicted with this disease, complain of being unable to live in certain situations. I have known two or three instances of such patients quitting a low situation, to reside in a higher one, who after long continued, or repeated trials, have never been able to accommodate themselves to it. The baneful effect of the new situation has, in such instances, been ascribed to some undefined peculiarity in the air—to the nox-

ious effluvia of a town, in which some particular trade is carried on—to difference of temperature—to any thing but what appeared to me to be the true cause, which in these instances has appeared to be confirmed, by the sufferers not being able to obtain a respite from their disease, in any part of the surrounding neighbourhood, preserving nearly the same level.

But we may come by an easy method, at more direct, and precise conclusions on this subject, An elevation of 500 feet (a very common variation in the surface of a hilly country) diminishes the average weight of the atmosphere pressing on the human body, something more than a sixtieth part, or nearly 600 pounds; and although this reduction of pressure is not felt, it cannot be doubted but that the removal of so large a degree of resistance, must give greater freedom of action to the main spring of the circulation, as well as a

greater power of distension to the vessels themselves; especially as was before remarked, to the superficial vessels: both of which causes, like all others, will operate most powerfully upon a diseased part.

I have found in my own person, that an elevation of 500 feet, has caused an acceleration in the pulse of five or six beats in a minute. I have also found, that any motion of the body, as rising from a sitting, to the erect posture for instance, has produced a greater corresponding increase of pulsations in the high situation than in the low one. These experiments have been repeatedly made with the greatest care: and without pretending to vouch for the accuracy of the proportions, I think I may venture to assert that they make something like an approximation to the truth. If also this difference is to be observed in health, while the controling power of life is in undiminished strength and action, and the balance

of the system under due regulation;—how much more may we not expect it to hold, when this power is weakened; and the delicate tissue of the lungs become enfeebled, or disorganised. In such a state of the pulmonary structure, the action of its vessels, from their greater irritability, and their exposed and unprotected situation—will be increased in a ratio greatly exceeding that of the other vessels of the body; and where a healthy person finds no change in his feelings; a patient thus circumstanced, will experience oppression at the chest, and difficulty of breathing, from the greater influx of blood into the pulmonary vessels. It should be observed that the preceding experiment can only be made on elevations accessible in a carriage, or on horseback: otherwise the labour of ascent will effectually defeat its object. A given time should also be allowed at the two stations for perfect rest before the observations on the pulse are made.

If it be objected, that the interest of the experimenter, might in these instances have affected the result of the experiment—the following observations are free from this objection; and place in a clear and satisfactory point of view, the effects of a great diminution of atmospheric pressure on pulmonary disease.

For two or three days previous to the 7th of December, 1817, the barometer had been gradually declining; when it suddenly fell more than an inch. The whole fall within the three days, amounting to one inch and a half: *viz.* from 29-8, to 28-3, where it remained till the afternoon of the next day; when it again as rapidly rose, and the next morning was 29-1, So sudden and great a reduction in the weight of the atmosphere does not often happen: and I was anxious to ascertain its effects on some consumptive and asthmatic patients then under my care. These effects were just such as I had

reason to anticipate. They were all worse; they all complained of increased tightness on the chest and difficulty of breathing; and the pulse in all was quickened. One of these, who had nearly recovered from a long continued, and most severe attack of spasmodic asthma, suddenly relapsed. I had left him two days before, better than he had been for several weeks before his late violent seizure; but I now found him struggling with another, as violent as that from which he had just escaped: which he described as having commenced suddenly on the evening of the sixth, and continuing to increase in violence to the period of my seeing him. Another asthmatic without a regular paroxysm of the disease, experienced great tightness and pain of the chest: and by subsequent inquiries, I found that many others had been similarly affected. One patient emphatically described his sensations by saying, that he felt as if his body would burst. The effects of this great dimi-

nution of atmospheric pressure and its subsequent increase, on the pulse of three patients in different stages of pulmonary consumption, taken at the same hour each morning, were as follow;

Dec. 8, Barometer 28. 3.

Michael King, Æt. 24 - - - Pulse 116
Sarah Hurl, —— 20 - - - —— 116
John Heritage —— 15 - - - —— 120

Dec. 9, Barometer 29. 1.

Michael King - - - - - - - 104
Sarah Hurl - - - - - - - - 108
John Heritage - - - - - - - 104

Two of these last were pretty nearly the average of the preceeding week: the other, Sarah Hurl, rather above it. Besides this reduction in the pulse,* the tightness and

* It is scarcely necessary to remark that observations on the pulse, in order to obtain an accurate result, should be made as nearly under the same circumstances as possible. The same time of the day — the same position of the body — the same distance of time after taking food — waiting a given time after the

difficulty of breathing were also relieved. William Scammel, Æt. 55, and Edward Brookman, Æt. 33, both labouring under the same disease, whom I had not an opportunity of seeing on the 8th, corroborated the statements of the others as to their feelings. Two patients with nasal polypi, were also considerably affected. In one case, that of a female who had not found them very troublesome in general ; they descended so as completely to obstruct the passage of the air : but on the following morning I found that they had resumed their ordinary state. The effects of changes in the weather upon polypous tumours, is experienced by every person troubled with them : but it has usually been ascribed to the relaxing effect of moisture, and partly no doubt with truth ; but on the above occasion the atmosphere shewed no unusual degree of mois-

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first questions have been asked, and perfect quiet on the part of the patient, must all be strictly observed.

ture, and was remarkably clear. This expansion of the polypus may serve to shew what was going on in the lungs of the asthmatic and consumptive patients; and we shall see that the increase in the number of pulsations, will not indicate the whole of the mischief. For although the lungs, contained within their bony case, have no power to increase their volume; the expansion of the blood vessels will diminish the capacity of the air cells, and satisfactorily account for the aggravation of the symptoms; especially the tightness and difficulty of breathing.

That variations in the temperature could not have much share in the changes which took place in the preceeding cases, will appear by referring to the heat of the days in which these changes took place. The mean temperature of the 6th, 7th, 8th, and 9th, were respectively 38, 41, 41, 36, by which it appears that a considerable reduction took place on

the 9th, which must be considered unfavorable, rather than otherwise, to the consumptive patients at least.

But if from an extensive survey of a district affording the requisite characters for such an investigation, it is found that phthisis pulmonalis and other affections of the lungs are frequent in its more elevated parts, while low and neighbouring lands are comparatively exempt from them ; we shall have sufficient confirmation of the utility of the practical tendency of these remarks, if not of the theory upon which they are founded.

The county of Somerset in which these observations and inquiries have been principally made, affords perhaps the happiest opportunity of acquiring a satisfactory result of any other in the island. A short topographical description will illustrate this. In no county perhaps, are the general outline and features of its dif-

ferent parts more strongly contrasted than in this; the one part abruptly terminating, and the other as abruptly commencing at a line of even and regular division. The long and elevated ridge of Mendip rising on the very edge of the Bristol Channel, traverses nearly the whole breadth of the county from west to east; shutting out from the inhabitant on either side, all view of every thing beyond it. This lofty range forming so prominent a feature in the landscape of the county, is no less conspicuous as constituting the boundary line between lands of widely different character lying to the north and south of it. The first portion, or that which lies between the Mendip hills on the south, and the river Avon on the north, is exceedingly irregular in its surface, but elevated, being for the most part from 300 to 700 feet above the level of the sea. The whole of this district is beautifully but not thickly wooded; the soil varying in its nature and properties, but generally of no great depth, and lying on a substra-

tum of limestone, or of a calcareous sandstone, thickly imbedded with marine substances; both of these are often found projecting in considerable masses above the surface. In this division is included a small portion of the adjoining county of Wilts. The air in such a district may be supposed to possess all the virtues which dryness and purity can give it. The whole has the character of being very healthy, and has afforded many instances of extreme longevity. Intermittent fevers are almost unknown thro' its whole extent; but pulmonary consumption exerts a wide and fatal sway. The other division, or that on the south side of the Mendip hills, consists of many thousand acres of meadow and moor land, but little raised above the level of the Bristol Channel, and a considerable portion of it a few feet below the high water mark. Here the intermittent and remittent forms of fever are frequent, but not so pulmonary consumption; from which this happy region may be said to be comparatively

exempt. These facts, namely, that of its infrequency in this district, and of its greater prevalence in the more elevated one just described, cannot escape the eye of a medical observer, and are unanimously supported by the observations of the medical practitioners in both.

But to determine this interesting question with precision, I have collected from the reports of these gentlemen, the number of deaths from consumption, above the age of 15, in different places in both districts within the last year; and have given their results together, with the necessary localities of each place in the subjoined table. The age of 15 has been fixed as the minimum, that cases of pure pulmonary phthisis only might be enumerated. I have also chosen to give the number of deaths from consumption in a given number of the living, rather than the proportion to the deaths from other diseases: as in this last method, which

is that adopted by Dr. Woolcombe, the result must vary according to the whole rate of mortality, and will be found to exceed the true proportion where that is low, and to fall short of it where high.* The elevations given for the different places are the mean of barometrical admeasurements taken on different parts of their surface. Places of trifling elevation, and which rise from a plain very nearly the level of the sea, as the town of Glastonbury for instance, may be estimated with sufficient accuracy by the eye. It should also be observed, that in the general estimate of the elevation of a place, the inhabited surface only is included.

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* Suppose for instance in a place containing 1000 inhabitants, the annual mortality to be 1 in 48, or nearly 21 in the whole, and the deaths from consumption 3; these will consequently be to the whole number of deaths as 1 to 7. But if the rate of mortality should be 1 in 36, instead of 1 in 48, and the whole number of deaths 28, the proportion would be only 1 to 9·36, the real number remaining the same.

	Place.	Population.	Mean Elevation in feet.	Number of deaths from Consumption in one year.	Proportion to 1,000 of the living.
High.	Frome . . .	10,000[1]	450	31	3·10
	Leigh upon Mendip .	750	790	3	4
	Hinton	600	580	2	3·36
	Maiden Bradly .	500	750	3	6
	Horningsham .	1,000	650	3	3
	Kilmington . .	600	825	3[2]	5
	Wells	5,000	50	11[3]	2·20
Low.	Glastonbury . .	4,000[4]	25	7	1·75
	Wedmore . .	3,000[5]	50	4·50	1·50
	Axbridge . .	1,100	50	—	0·20
	Wimbourne in Dorsetshire[6]	3,300	50	7	1·95

(1) The town only, exclusive of the rest of the parish.

(2) Average of five years.

(3) This is supposed to be above the general average for Wells.

(4) Glastonbury and its vicinity, containing a population to that amount.

(5) With its vicinity.

(6) The town of Wimbourne is inserted here from its correspondence with the other places; but the inquiries made in this place were directed to another object, as will be seen in a subsequent part of this inquiry. Its elevation is estimated from its position on the level banks of the Stour; which, running a placid course of not more than twelve miles to the sea, the town cannot much exceed the elevation assigned it.

By this table it appears, that the difference between the low and elevated situations is great indeed; and the particular case of Axbridge is so extraordinary, that I feel it incumbent on me to give the words of the report from which it is taken.*

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* Letter from Mr. Good, of Axbridge, to the author.

Sir,

In answer to your inquiries as to the number of deaths that have taken place in Axbridge, and its vicinity, within the last twelve months, from phthisis pulmonalis, I have to observe, that I know of no one instance, either at fifteen or any other age. In short, I consider pure phthisis pulmonalis as by no means a frequent disease in this neighbourhood, having met with only two instances for some years past. These were two remaining sisters (the one twenty, the other twenty-four years of age,) of a large family, who all died consumptive. The town of Axbridge contains from one thousand to eleven hundred inhabitants, and the surrounding villages are populous.

Several cases of hæmoptysis have come under my care within the last few months. Plethora, as a consequence of free living, appears to have been the cause, and they universally gave way to the use of the lancet.

If it be objected that twelve months do not constitute a sufficient length of time to afford a conclusive average, it is hoped that what is wanting in time, may be made up by the number and agreement of the reports; and the objection may perhaps be further removed, when it is observed, that the places from whence the reports are transmitted lie within a circle which the eye may command from a point of eminence, and the period of time in which they are included, is nearly the same in all. It may be justly supposed then, that the causes,

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I delayed answering your letter that I might inquire how far the practice of my neighbours agreed with my own, and I have the satisfaction to say, that they have been nearly similar.

I am, Sir,

Your very obedient servant,

Axbridge, Oct. 22, 1817. J. GOOD.

As the vicinity of Axbridge is included in this report, it is probable that the proportion given in the table, low as it is, may yet be higher than the truth. This neighbourhood may indeed be said to enjoy an unheard of exemption from pulmonary disease.

be they what they may, which influence this disease, must have operated equally upon all: and whether we consider the actual numbers as affording the usual average of each place or not, the proportional ones may be considered as perfectly satisfactory. But I have no reason, either from what has come under my own observation, or from the statements connected with the different reports, to consider them (with the exception mentioned in the table) as being any other than the ordinary average of successive years.

There are some other circumstances connected with the localities of the low situations mentioned in the table, which it may be necessary to explain, in order to set in as clear a light as possible the probable causes of exemption from consumptive complaints. The town of Axbridge, in which the most remarkable exemption appears, is a little elevated above the moor, just sufficient to escape the

prejudicial and chilling influence of concentrated moisture, or of any other noxious matter. The marshy ground occupies only one side, and that removed to some distance; while the other places, with the exception of Wells, are nearly surrounded by it, and the greater part of their surface on a level with it. It will be recollected, that the authorities adduced in the early part of this paper, attributed the comparative exemption from consumptive complaints which they had remarked in marshy situations, to their quality as such, or to a reduction in the purity of the atmosphere: but the above facts seem to declare, that it is on some other principle that we are to account for the salutary properties of such situations.

To the instances enumerated in the table, may be added those of Shrewsbury and Carlisle; the first of which, according to the registers of the Rev. Mr. Gorsuch, gives a

proportion of 6* to 1000 of the living, and the latter, according to those of Dr. Heysham, 1·92. Now the position of Shrewsbury on the Severn, at the distance of 100 miles from its mouth, must give it an elevation of at least 400 feet; while that of Carlisle, on the Eden, can scarcely amount to a fourth-part of that altitude. The proportion assigned to Shrewsbury is extraordinarily great, and perhaps may be swelled by the admission of diseases which could not properly be called pulmonary consumption; but even making a deduction on

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* The population of Shrewsbury is 18,543: the annual mortality, at the time these registers were kept, 1 in 26, which gives for the whole mortality 713. The deaths from consumption in the whole population, are to the whole mortality, as 1 in 4, or as 11·14 to 1158·75 of the living, which, for convenience of numbers, and to avoid the side of excess, may be called 9 in 1000; from which, deducting one-third for those under 15, which appears by Dr. Heysham's tables to be the proportion of those who die under that age to those above it, there will remain six.

this account, the proportion must still be high. With respect to Carlisle, the extreme minuteness and accuracy of Dr. Heysham's registers, leave no doubt of the proportion being perfectly correct.

There is one circumstance of a practical nature arising out of this part of the present inquiry of vast importance. The relative prevalence of consumption, in high and low situations, although leading to an inference exceedingly satisfactory, does not afford a true measure of the effect which we may expect will be produced by a removal to the one situation, of a person who has resided in the other. Where there is an undoubted predisposition to the disease, or where its admonitory symptoms may have already shewn themselves, a removal to a lower situation, when practicable, may avert it in the one case, and suspend its progress in the other. While, on the other hand, quitting the accustomed situation,

to reside in a higher one, may call the disease into immediate action where latent, and give it new force where it has already commenced. The natural powers of the constitution in the situation to which it has been habituated, may be able to maintain, for a time, the struggle with its deadly foe, and to postpone the visible advances of disease:—but if a powerful auxiliary be abandoned by removing to a more elevated site, the disease once set free from constitutional controul, will run its course with fatal rapidity. A medical friend informs me, that two members of his own family sunk rapidly under pulmonary consumption after quitting low situations to reside in elevated ones. A similar fate attended a medical gentleman who practised some years ago at Wells, who fell a prey to the same disease shortly after leaving that city to practise in an elevated part of Gloucestershire. The universal fatality attending this disease in the numerous cases which are reported to have resorted to Richmond,

in Yorkshire, will also illustrate this part of my subject; and I think it will not be asserting too much to say, that to remove to situations higher than that which had been previously inhabited, in any stage of pulmonary consumption, is to run into the very jaws of death.*

I would wish not to be prolix in my observations, or advice on this subject; but I am

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* The greater degree of cold, in an elevated situation, has generally been assigned as the reason of its being unfavourable to consumptive diseases, where that has been noticed, as in the case of Richmond: but if this were the true cause, a greater proportion of such diseases should be found at Carlisle than in the elevated places which have been described, situated four degrees farther to the south. Every degree of latitude removed from the pole, gives, other things being equal, about a corresponding degree of annual temperature; and every 250 feet from the earth's surface diminishes the heat in the same proportion. If temperature then were the only cause of difference in the proportion of pulmonary disease, this should be smaller at an elevation of 700 feet, in latitude 51, than at the level of the sea, in latitude 55.

anxious to say enough to fix the serious attention of the parents, and relatives of consumptive families, on these important truths, for such, I think, I am warranted in calling them. How many parents are there at this moment suffering under the anguish of recent, perhaps of repeated losses from this devouring disease; trembling for the fate of the one which appears to be marked out for the next in succession, at whose vitals the monster's dart is already pointed, and eagerly looking round for directions what step to pursue, uncertain whether to remain or to fly,—and if to fly, whither to go! To such I would exclaim with all the earnestness which a conviction of its importance must naturally excite—fly—fly if it be in your power, and before it is too late, from the fatal spot. It may be death to remain; there may be safety in flight. Fly then to some more favoured situation, answering in its character to those which have been described. If you know not wher else to find such an one, (and

there are probably not many,) go thither without delay.

As the practical design of this inquiry is to ascertain, upon certain data, the most salutary residence for the consumptive, it would be incomplete without extending it to the sea side; which, especially on the southern coasts of this island, under the supposition of their possessing a milder and softer air, is so often resorted to. Places of general resort near the sea, as well as most others, are commonly but little raised above its level; and, according to the foregoing principles, should be considered as salutary in consumptive complaints:—but there appears to be some other cause of a counter tendency, whose operation must probably remain in obscurity, which produces in such situations a proportion of disease, greater I believe, than is generally suspected. The evidence upon which this fact is to be determined, is drawn chiefly from other sources

than my own inquiries; but they will be found fully to substantiate one another, and all make the proportion very high. On the eastern coast of America, consumption appears from various authorities collected by Dr. Southey, to be nearly as fatal as in Great Britain. In Portsmouth, New Hampshire, it is asserted that one-fifth of the deaths are produced by this disease. The same proportion occurs at New York;* at Boston the proportion is stated to be very great; while *at the distance of thirty miles from the sea it is much less.* At Carlscrona,† on the south coast of Sweden, the

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* Dr. Johnson, in an oration delivered before the Medical Society of South Carolina, in 1807, says, that the deaths from pulmonic diseases at New York, bear a proportion of from one-fourth to one-third of the whole mortality.—*Lambert's Travels in North America.*

† The exact proportion for Carlscrona, as calculated from the tables of M. Nicander, is 2·43 to 1000 of the living: but as the cases enumerated in other places have been confined to those

proportion, although low, is greater than the average for the whole of that country; the proportion for the whole of Sweden and Finland being about one-fifth higher. At Plymouth, in Devonshire, the proportion, according to Dr. Woollcombe's tables, appears to be very high ;* and the authority of another

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above fifteen years of age, a third of the whole must be deducted on this account, as has been already explained in the instance of Shrewsbury. The proportion will then be 1·62 instead of 2·43.

It is worthy of observation with reference to the small proportion of pulmonary disease at Carlscrona, that the waters of the Baltic, according to the experiments of Dr. Thomas Thomson contain but a little more than one-fifth of the saline matter contained in the Atlantic. What share of influence the proportion of saline ingredients in the water of the ocean can have on that of pulmonary disease on its borders, I do not pretend to conjecture; but the fact is remarkable.

* From these tables it appears, that the proportion of mortality from consumption to that from other diseases, is as 1 to 4·28. Now as the whole mortality is stated to be 640, and the

physician of the same place, is brought by him in proof of the greater prevalence of consumptive complaints in the little towns and villages on the sea side near Plymouth, than in the country at large.

From an accurate return, with which I have been favoured, from the town of Poole, in Dorsetshire, the high proportion of consumptive complaints on the sea coast is further confirmed. By this return it appears, that in a population of 4850, twenty deaths have taken place from consumption during the last year; or 4·12 in a thousand: while in the town of Wimborne,

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population 16,000, the proportion of deaths from consumption, to 1,000 of the living will be nearly 9; from which deducting one-third for those under 15, there will remain 6. But as this proportion is taken from Dispensary practice, it is doubtless too high for the general population. It will, perhaps, be near the truth, if we subtract one-fourth of the whole on this account; which will give 3·75 for the true proportion.

only six miles distant, and separated from it by a ridge of low hills, the proportion, as has been already given in the first table, is not quite a half; or only 1·95 in a thousand. Further data may be wanting, on which to found general conclusions, with respect to the comparative prevalence of consumption near the sea; but these facts, as far as they go, are very decisive.

The following table will shew, at one view, the comparative mortality from consumption, in all the places which have been mentioned.

TABLE.

Places.	Population	Mean Elevation in feet.	Number of deaths from Consumption in one year.	Proportion to 1,000 of the living.
Shrewsbury . . .	18,543	Estimated at 400	119	6
Maiden Bradley .	500	750	3	6
Kilmington . . .	600	825	3	5
Poole	4,850	Sea side	20	4·12
Leigh upon Mendip	750	790	3	4
Plymouth . . .	—	Sea side	—	3·75
Hinton	600	580	2	3·36
Ackworth in York[e] .. [1]	728	Unknown	4	3·13
Frome	10,000	450	31	3·10
Horningsham . .	1,000	650	3	3
All England & Wales [2]	—	—	—	2.74
Wells	5,000	50	11	2·20
Wimborne . . .	3,300	50	7	1·95
Carlisle[3]	—	Estimated at 100	—	1·92
Glastonbury . . .	4,000	25	7	1·75
Carlscrona . . .	—	—	—	1·62
Wedmore . . .	3,000	50	4.50	1·50
All Sweden and Finland[4] ..	—	—	—	1·34
Axbridge . . .	1,100	50	—	0.20

(1) Price on Reversionary Payments. The number of inhabi-

Setting theory aside then, it appears from the facts which have been adduced, that a low inland situation is by far the most favourable for consumptive patients:—and if with such a situation can be obtained a more equable, and

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tants in the parish was 728; the deaths from consumption in ten years ending 1767, thirty-eight, which will make after the deduction of one-third, a proportion of 3·13 to 1,000.

(2) The annual mortality for England and Wales, on an average of ten years ending 1810, appears from Mr. Milne's table p. 437, v. 2, to be about one in 48; from which is deduced 205,000 for the whole mortality. It further appears from Dr. Woollcombe's sixth table, that the proportional mortality from consumption to that from other diseases, may be estimated at about one in five for the whole kingdom; which will give 4·1 as the annual number of deaths from consumption in a thousand of the living; from which deducting one-third, there will be 2·74. But as it is probable, that the rate of mortality which Mr. Milne has taken for the whole kingdom is too low, from causes which will be noticed hereafter, the number of deaths from consum tion must be too low also.

(3) Dr. Heysham's Registers.

(4) M. Nicander.

somewhat superior temperature, than that of the general average of this island, we shall possess every local advantage which our climate will afford. Just such a situation is that which I have described, as lying on the southern side of the Mendip hills.* Its geographical position in the south-western part of the island.—The shelter afforded by the range of hills towards the north, and the lowness of its level, while spots may be chosen just sufficiently raised above the marshy lands to escape the prejudicial and chilling influence of concentrated moisture:† without being so high as to

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* I find from meteorological observations which I have made for several years at Frome, that the temperature in the winter and spring months, is three degrees higher at that place, than at Althorp, in Northamptonshire, as appears from the register published in the Journal of Arts; and about three lower than at Sidmouth, from the tables of Dr. Clarke. Allowing two degrees for the elevation of Frome, there will be a difference of five degrees between Althorp and Wells or Axbridge; and only one between those places and Sidmouth.

† This may be considered a desirable object; and in making

defeat the object in view, point it out as one of the most eligible. To these advantages of a physical nature, may be added others of a more obvious and inviting character. The varied and romantic scenery of the neighbourhood cannot fail to charm those who possess a relish for the beauties of nature; while the tastes and habits of individuals may be gratified in the society of a city, or the seclusion of a village.—There are, doubtless, other situations, em-

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choice of a low situation, the immediate neighbourhood of a river, or of wet and marshy ground should be avoided. The precipitation of moisture which takes place in these situations, on any sudden reduction of temperature, is extremely prejudicial to animal and vegetable life; and reduces the temperature much below that of the air immediately above it. I found an hour after sun-set in the month of September, that a thermometer sunk five degrees, when removed from an elevation of 100 feet, and immersed in the fog, which covered to the depth of 20 feet, a river and the adjoining meadows immediately beneath; and I have on other occasions observed, a similar and even a greater difference, when there has been no visible fog.

bracing equal advantages, but I believe them to be by no means numerous. The same level is not often found sufficiently removed from the sea, to escape the injurious effects of the air blowing immediately from it. It is true that several of the eastern counties afford such a level of vast extent: but their situation further to the north, and their unsheltered exposure to the full sweep of the eastern air, renders them objectionable. It is next to impossible that the midland counties should possess such a situation as that desired; while in the southern and western ones, they must be few from the causes which have been assigned. It is a very easy thing for a person not accustomed to such observations, to be misled in this respect. Every situation is not low which appears to be so: it may be low indeed with respect to the land surrounding it, while its actual elevation is considerable. In conversing with medical friends on this subject, it has frequently been objected, that in certain low situations within

their circle of practice, they have found a large proportion of consumptive cases: but these situations, which either as extensive flats, or deep and narrow vallies, when submitted to actual measurement, were found to be at a considerable elevation. The valley, in which the extreme branch of the river Willey, called the Deveril, has its source, in Wiltshire, may be particularized as an instance of this kind. The head of this valley, which is of considerable extent, is bounded on each side by a wall of hills, rising precipitously to the height of 300 feet, which give it its character of a valley, and at the same time give rise to a deceptive estimate of its elevation, for the valley itself is not less than 700 feet above the level of the sea. Wiltshire abounds with similiar situations.

"Devon's myrtle vales" may afford favourable situations which combine the advantages to be obtained from elevation and temperature: but many of the favoured resorts of this county

are too near the sea; and its interior rises rapidly towards the central region of Dartmoor.

The buildings in the neighbourhood of the Bristol Hot Wells are well situated in point of elevation and shelter: but consumptive patients resorting to this place, should confine themselves to the bottom of the hill, and by no means think of residing on his ascent or summit. The disadvantages under which the Hot Wells may be supposed to labour, when compared with the district which has been recommended, will be found in their close vicinity to the river, and to a large city.

Every place which I have had an opportunity of examining, confirms me in the opinion, that situations, uniting all the desired local advantages, are very few; and in proportion to the difficulty of finding such, should be the value attached to that, whose comparative exemption from consumptive diseases is established upon the

most unequivocal evidence. A salutary retreat may here be found at all seasons of the year, and especially during the winter and spring months, from the mildness of the air, and the shelter afforded by the Mendip Hills; which, like a stupendous wall towards the north and north east, afford an effectual screen to the winds blowing from those points, which, especially in the spring, are generally the most prevalent.

Amongst the causes of pulmonary consumption which may be considered as local, although not strictly so in the sense implied in this treatise, is the breathing a dusty atmosphere: and I consider this a circumstance of so much importance in the choice of residence, that I cannot refrain from offering a few admonitory hints respecting it.

Those who live in large cities, and in the vicinity of public roads, can never be said to breathe a pure air in dry and warm weather.

The clouds of dust which are incessantly raised by the passing throng, and which may be said never to have time to settle 'till some friendly shower allays and fixes them to the ground; from their extreme tenuity pervade every place within their reach, and become the sources of something more than mere inconvenience. I am persuaded that air, however pure it may be at other times, becomes when thus loaded, a powerful cause of irritation and subsequent disease in the lungs. It has been remarked by many accurate medical observers, that hair-dressers, stone-cutters, coal-heavers, workers of flax, feathers, cotton and silk, scythe and needle-grinders, and all those exposed to a powdery atmosphere, are amongst the most liable to consumption of the lungs: and there can be no reason why the heterogeneous particles which are raised in much greater abundance from our streets and roads, may not, at least to tender lungs, be equally injurious. I never meet a stage coach, or open carriage rolling

along a dusty road, and almost invisible from the cloud with which it is enveloped, but I picture to myself the air cells and passages in the lungs of those whom necessity or pleasure may have induced thus to expose themselves, coated in the same manner, though in a less degree, as the outside of their persons, with the probable train of evils arising out of such a condition. That a proportion of dust must, notwithstanding the provisions of nature for its exclusion, be inhaled into the lungs, is inevitable;—that it has any mode of escape from thence, without exciting disease, is not quite so clear.

There is, as is well known, much more travelling in England than in any other country in the world. This, on account of the peculiar construction of our roads, produces much more dust in the road itself and its neighbourhood, than perhaps is common in other countries;—and who will venture to say that

this may not be one, at least of the local, if not of the national causes of pulmonary disease? What must be the state of the lungs in the inhabitant of Knightsbridge and Kensington?

The practical intent of these observations, which would otherwise be a departure from my subject, is to caution the consumptive, and the weakly in general, from residing in dusty streets, or in the neighbourhood of frequented roads in the summer time; and to advise those, who move for change of air, to bear this caution in mind in the choice of residence, and even in their walks and rides. Such a state of the atmosphere as must always prevail in such situations at that season of the year, will counteract every other local advantage.

It would be a curious, and at the same time an useful inquiry, which should be directed towards ascertaining the proportion of pulmonary disease amongst the inmates of the

rows of dwellings which are so absurdly made to line the great avenues to the metropolis. What renders this observation, and the proposed inquiry of more importance is, that in these situations are to be found almost innumerable receptacles for the youth of both sexes, and especially females. Seminaries, academies, and preparatory schools, catch the eye at every step. Let those who voluntarily make choice of such a situation, and fancy that they are living in the country, live there still. But before our children are placed during the most important and most susceptible years of life, within the possible reach of such danger, it were well that both parents and preceptors should look to it.

Temperature, has always been supposed to hold a considerable influence over the rise and progress of pulmonary consumption; and as it is found to vary in almost every country, and in the same country in different parts and

altitudes, a consideration of it necessarily forms a part of the present inquiry. It is frequently observed that phthisical symptoms, contracted in the winter season in this climate, are suspended during the warmer months; and hence no doubt has arisen the practice of sending consumptive patients to seek relief in southern latitudes; but with what success, the cemetries of Lisbon, Nice, and Madeira, can best tell. The advantages of a mild and regulated temperature, in every stage of pulmonary consumption, are fully established by the practice of some eminent British physicians: but it would have been worth while before fixing on any foreign stations for the reception of the consumptive, to have ascertained the relative proportion of native disease; and if this be received as the test of their fitness, it will be found that they must yield even to some of the more rugged climates of the north. Dr. Beddoes says, that a physician who resided two successive winters in Portugal, informed

him, that consumption is frequent amongst the natives; and that his observations convinced him of the small efficacy of the climate.* From the cases related by Dr. Canella, and the manner in which they are given, as well as from the observations of other Italian physicians, it would also appear that Italy can lay no claim to exemption from this disease; but that it is on the contrary to be considered as one of the most common disorders of the country. Dr. Irvine, speaking of the prevalence of consumption amongst the natives of Sicily,† says, "It is an ordinary and dreaded disease amongst them." He says, also, "The symptoms of consumption do not at all differ here from those of the same complaint in England. It runs the same course, is attended with the same fallacious hopes of recovery, and terminates in the same sudden and unexpected manner."

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* Essay on Consumption.

† Observations on the diseases of Sicily,

Neither does the far-famed climate of Madeira appear to possess advantages superior to those of the countries just mentioned. Dr. Beddoes tells us, that he was informed by a medical friend who resided there some months, that scrophula and consumption are by no means uncommon. Two among the British settlers, persons who did not go out as invalids, died of consumption within twelve months; and a resident lady of delicate health fell into the same disorder. "This proportion" says Dr. Beddoes "would be reckoned not inconsiderable even in Britain." Dr. Gordon under whose care some consumptive patients were placed in Madeira by Sir John Pringle and others, discouraged the practice of sending them thither.* Dr. Gourlay says, "It is not to be concealed that no malady is more prevalent here than phthisis with the natives of

* Vide Dr. Reid's treatise on consumption.

the island. Persons of all ages, and both sexes, fall victims to it; nay, whole families have at times been suddenly swept away by it."* Now the serene atmosphere, and the mild and almost uniform temperature of Madeira, would to us, who are accustomed to consider a cold, humid, and variable climate, as the great national cause of the disease, seem to point it out as the most desirable spot for consumptive patients with which we are acquainted: and such seemed to have been the high opinion entertained of it, till sad experience shewed its futility.

There are two reasons founded on the foregoing observations which constitute Madeira, notwithstanding its admirable climate, a very unfit residence for the consumptive. The first

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* Observations on the Natural History, Climate and Diseases of Madeira.

is, that the small size of the Island, can afford no spot of moderate elevation, at a sufficient distance from the coast, to escape the too stimulating effects of a marine atmosphere. The second, that the rapidity with which the land rises from the sea shore towards the centre of the Island, precludes the possibility of finding such an one in its interior parts. Some idea of the rapid ascent of the face of the country may be formed, when it is stated, that in an average breadth not exceeding eleven miles, it rises to the stupendous heighth of upwards of eight thousand feet.

On the other hand, in Russia, where winter reigns with a severity little known to us during half the year, pulmonary consumption, on the authority of Dr. Guthrie, who practised many years in that country, is a rare disease.* In Sweden and Finland there appears a similar,

* Philosophical Transactions, Vol. xlviii.

and as it can be ascertained with greater precision, a more satisfactory exemption: the number of deaths from consumption in that country, being according to the tables of M. Nicander, something less than half of those from the same disease in Great Britain. In Denmark Lord Molesworth says that "few or none of the Danes are troubled with coughs, catarrhs, consumptions, or such like diseases of the lungs,"* which he attributes to the warmth of their stoves and their wood fuel: but in the north of Germany, where the fuel is the same, and great attention is paid to the stoves, the proportion of consumption is nearly or quite as great as in Great Britain.† Even in Lapland, Linnæus speaks of consumption as infrequent.‡ The countries which have been reported to be the most exempt from this

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* Account of Denmark.

† Edinbnrgh Medical Journal, No. 7.

‡ Tour in Lapland.

disease, are, Egypt and Bengal: and here I beg to call attention to the topography of these, as well as of those northern countries which have been cited as being also comparatively exempt from it. Egypt, as every one knows, is one vast plain of but very trifling elevation. The same may be said of the extensive plains of Bengal. Sweden is almost an universal flat at a low level. Denmark is the same: and so also are those Russian provinces which are likely to be visited by foreign physicians.

I trust that sufficient evidence has been brought forward to shew that independently of other causes, the prevalence, and fatality of consumption are materially influenced by situation; more especially as regards altitude: and if it be so, little further need be said of the importance of such a fact, or of the advantages which may be made to accrue from an acquaintance with it. The experience and the

improvements of ages have done very little for the cure of this formidable disease; which is still the scourge of our country, and the destroyer of the fairest and most promising of its inhabitants. Whatever view we take of it, it acquires a magnitude and importance peculiar to itself. Other diseases attack indiscriminately all ages; before the social attachments have been formed, or after nature has dissolved them, and the disease comes as the looked-for messenger of fate: but consumption, seizes in its unrelenting grasp, the young, the beautiful, and the intelligent; at a time when the bonds of social connexions are closely tied, and when in the relation of child, parent, or citizen, the loss is the most severely felt.* But

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* It appears from registers kept at Chester, Warrington, and Plymouth, that the period between 30 and 40 is that in which consumption most frequently proves fatal; the deaths occurring within that term being equal to all those before thirty, and rather greater than those happening after forty. At the hospital

it is as a growing disease that consumption assumes its most important feature. It has with justice been termed the giant malady of the country; and with fearful, and giant-like strides does it gain upon us. Its rapid and universal increase must strike every humane and reflecting mind with dismay; and excite the best founded apprehensions of its desolating effects on future generations. It appears probable from the calculations of Dr. Woollcombe, that the number of deaths from consumption in Great Britain, have increased one-third within the last century; and that they have now reached the enormous amount of fifty-five thousand annually.

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of La Charite, at Paris, in 100 patients who died of consumption, 38 is the age at which the numbers are equal of those who died before and after. I should, however, be inclined to think, that these observations, though true with regard to hospital and dispensary practice, are not applicable generally.

If these things be so; if consumption is proved to be increasing in frequency and fatality; and if it be still found to baffle the united efforts of art and science for its reduction — "Let us not (to use the language of the author just mentioned) vainly hope to find an antidote to its ravages in the hidden stores of nature; but let us rather strenuously seek to ascertain the causes of its extended influence, and endeavour, by all the arts of prevention, to obviate the attack of a foe which prudence may assist us to avert, but no prowess will enable us to overcome." It is not the design of this treatise to investigate these causes, or the arts of prevention, otherwise than as they are contained in the advantages and preventive checks, to be derived from the influence of local circumstances; and in establishing upon statistical facts the certainty of this influence; and pointing out to the victim of this inexorable disease a place of resort where he may probably obtain a suspension of its ravages;

and to those predisposed to its attacks, or already threatened with them, where, in conjunction with other preventive means, it may be retarded or wholly averted,—I shall have acquitted myself of an important duty; and if the result of my inquiries and observations be supported by those of others, I may think myself happy in having performed a no less important service to a numerous and interesting portion of my fellow creatures. The victim of consumption will in this case no longer be left to the guidance of popular opinion in a matter of vital importance; nor be sent to pant rather than to breathe in elevated situations in search of pure air; nor to the sea side, to inhale an atmosphere which however difficult it may be to account for the fact, appears to be far from salutary. Nor will he find it necessary to fly an exhile from his friends and his home to seek a doubtful advantage in a foreign clime; or what is more probable, to die unheeded amongst mercenary

strangers, a speedier victim to his disease, in consequence of the privation of those comforts, and that society, which were essential to his existence;—with no dear friend, who, by a thousand kind offices necessary to his support in this trying situation, can smooth the path to death;—and lastly, without those consolations which the sacred minister of his religion, at this awful period, can alone administer.

PART II.

ON THE

INFLUENCE OF SITUATION

ON THE

DURATION OF LIFE.

PART II.

HAVING in the preceding pages considered that state of the system were the powers of life are morbidly active, and the resistance opposed to them weak and ineffectual; we come now by an easy transition, to consider the converse of this state; and to inquire what happens in old age, where power is diminished and resistance increased; as well as in debility from other causes, and in convalescence from acute disease; where the vital powers are reduced, and resistance if not absolutely increased, may be considered as relatively excessive.

As life advances, the vigour of its active principle declines; while mechanical obstructions from various causes, accumulate to oppose its functions, until resistance overbalances power, and life is extinguished. The soft parts grow rigid; the vessels themselves sometimes become ossified, and their extreme branches obliterated; the valves of the veins frequently relaxed, or ruptured, cease to perform their office, and the tardy column of blood is with difficulty urged on to complete the circulation. Under such accumulated circumstances of oppression, how great must be the labour which the heart has to perform! at a time too when the sinking powers of nature require a lightened, rather than an augmented load. The weight of the atmosphere also, which in youth and health serves only to restrain inordinate action, now comes in aid of the other resisting forces, and contributes its share to oppose, and finally to overpower the vital actions. At that point

of life in which the acting and the resisting powers are nearly balanced; or in which the latter begin to preponderate; a very slight additional superiority required by either may be followed by important results. If the acquired advantage be in favour of the vital forces—the causes which have been described as opposing their freedom of action, may be for a time averted, or if in a state of incipient formation, be overcome. If the same advantage be on the side of the resisting powers—the effect of the acquired power may be greatly disproportioned to its degree. It may so happen that life is already assaulted by the full amount of force with which it is capable of contending, and a slight increase be sufficient to end the conflict; and as the causes of mechanical obstruction which have been mentioned as arising from altered organization, do not come within our control, it is of importance to inquire what advantage may be obtained by a due regulation of those which do:—one, and

perhaps the chief of which, is the weight of the fluid which surrounds us.

Enough it is hoped, has been already said in the first part of this treatise to prove that this opinion is not altogether chimerical. Sufficient evidence was advanced to shew that excessive action was induced by diminished, and moderated by increased atmospheric pressure. It might by fair inference be assumed then, that the languid actions of debility, and of old age, may by the same means be either overpowered or invigorated. But the fact of their being so, does not rest on an assumption: the same description of evidence is at hand, and through every region of the globe, we shall find, that distinct from the influence of other physical causes; in climates so widely different as those of Siberia and Peru, the average duration of life corresponds with the elevation of the different countries, or of their respective parts. So

universally does this axiom appear to hold good, that, the general elevation of a country being given, the probable age of its inhabitants may with tolerable accuracy be ascertained; provided they are not given to habits of intemperance, nor visited by any exterminating pestilence. There is scarcely a traveller of observation from whom some fact may not be gleaned in conformation of these remarks. Pallas says, that in Siberia the inhabitants of the mountains, attain a much greater age than those of the plains. Humboldt asserts that the aborigines of the elevated plains of Mexico attain a great age, and that appearances of decay do not come on till very late. The same thing is to be observed in similar situations in Peru. "It is by no means uncommon," he says, "to see in Mexico, in the temperate zone, half-way up the Cordillera, natives, and especially women, reach a hundred years of age. This old age is generally comfortable; for the Mexican and Peruvian Indians preserve their

muscular strength to the last. While I was at Lima the Indian Hilario Pari died at the village of Chiguata, four leagues distant from the town of Arequipa, at the age of 143. He remained united in marriage for ninety years to an Indian of the name of Andrea Alea Zar, who attained the age of 117. This old Peruvian went at the age of 130 from three to four leagues daily on foot."* It is stated in the Mercurio Peruviano published at Lima, that both the Peruvian Indians, and the Creoles are remarkably long lived, and retain their faculties and bodily vigour to a very advanced age. In the small province of Caxamarca, situated in an elevated plain,† between two ridges of the Andes, and containing hardly 70,000 inhabitants, there were eight persons alive in 1792,

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* Political Essay on the Kingdom of New Spain, Vol. 1, p. 151.

† Humboldt gives this valley an elevation of nine thousand feet.

whose ages were 114, 117, 121, 131, 132, 135, 141 and 147: and in the same province a Spaniard died in 1765, aged 144, leaving 600 persons lineally descended from him. Dr. Reineggs gives a similar account of the Lesghæes or inhabitants of the higher parts of Mount Caucasus, "where they live to a great age. It even seems to flee from them; for thirty and forty years appear to have no effect on their vigorous constitutions."*

If we turn our eyes to the Continent of Europe, the difference in the proportional duration of life in low and mountainous districts is very striking. Thus in Norway, the annual mortality is one in 48; while in the neighbouring country of Sweden, which has already been described as an almost universal flat, at a low level, the number is one in 34; and in Holland, a still lower level, it is as

* Wilkinson's Mount Caucasus.

high as one in 23. Mr. Townsend, in his travels in Spain, speaking of the Austurias, says, " Few countries can produce more examples of longevity: many live to the age of one hundred; some to a hundred and ten, and others much longer. The same observations may be extended to Gallicia, where in the parish of St. Juan de Poyo, A. D. 1724, the curate administered the sacrament to thirteen persons, whose ages together made one thousand four hundred and ninety nine, the youngest of these being 110, and the oldest 127." The elevated and mountainous character of these provinces is sufficiently known. But in Switzerland, as the most mountainous country in Europe, we should expect to find the theory hold good: and accordingly it is in this country that we find the most remarkable instances o the general duration of life. In some part of the Pays de Vaud, the general mean duration of life is above 45 years; while following the course of the Rhone, in the Lyonois, it is but

a little above twenty-five years. But the village of Leyzin, in the Alps, affords a still more remarkable example of general longevity: the probability of life in this parish being, according to M. Muret, as high as sixty-one years.

In our own country the difference is equally striking. It is curious to trace the decreasing progression in the mortality of the different counties, as their surfaces increase in elevation. Thus, in Essex, the annual mortality is one in forty-two; in Cambridgeshire, one in forty-three, and in its marshes, one in thirty-three; in Huntingdon, one in forty-seven; in Lincolnshire, one in forty-nine, in its marshes, one in thirty-three; in Wiltshire and Shropshire, one in fifty-five; and in Gloucestershire, it is stated as low as one in fifty-nine. The great and unusual duration of life which this statement gives to the inhabitants of this county, would appear from its

character to be scarcely reconcileable with the theory. But Gloucestershire without presenting the rugged aspect of what might properly be called a mountainous district, possesses a general elevation of inhabited surface superior to any in the southern part of the kingdom of equal extent, or perhaps in any other part. It is here that the Thames has its source; which is alone sufficient to bespeak its elevation. Rudder in his History of Gloucestershire gives several instances of natives of this county who have reached a great age. Amongst these the parish of Siddington St. Mary, situated in in that part of the county which gives rise to the Thames, affords the most remarkable examples. The rector of this parish, Dr. George Bull, buried ten of his parishioners, whose ages together made one thousand years; two of whom were one hundred and twenty three years each. It must not be forgotten in estimating the comparative healthiness of this county, that it contains many considerable

towns, and that a large proportion of its inhabitants are employed in the clothing manufacture: circumstances which taken together, must tend to depress the average duration of life; and which consequently place in a still more striking view, the advantages arising from the nature of its surface. The proportion for the whole of Wales is calculated at one in sixty. Cornwall is also stated at one in sixty. If this be correct it must be attributed partly to elevation, and partly to the mildness of the winters in that county.

It is probable that the whole of these calculations deduced from the population returns, give a rate of mortality more apparent than real;—mistakes in the number of the people;—omissions in the registry of burials;—emigrations;—and the numbers in large towns especially, interred in burying grounds belonging to dissenters, are so many causes of error; and will invariably lead to a computed rate of

mortality much below the truth. I know that all these causes have in many places operated to a very great extent. These calculations may however afford a just measure of the relative rates of mortality for the different counties.

With respect to Scotland, the Statistical Account of that division of the Island, might naturally be referred to, to furnish important illustrations of this subject. But "on account of the acknowledged omission in the registers of births, deaths and marriages, in most of the parishes of Scotland," as is observed by Mr. Malthus, "few just inferences can be drawn from them." Sir John Sinclair, however, remarks, that there are more instances of people who have reached to a great age, with the full possession of bodily and mental faculties in Scotland, than in any other country in Europe.

Dr. Lister remarks in No. 165, of the Philosophical transactions, "The vast number of old men and women to be found upon the mountains of England comparatively to what are found elsewhere;" which he ascribes to the healthfulness of cold. And in another place he says, "I am confident many scores of persons might be found of the age of a hundred years among these northern mountains;" and it is remarkable, that all the instances he produces of persons who lived from a hundred to a hundred and forty years, were found upon that central range of elevated, and mountainous land, which has been aptly termed the English Appenines, and principally in the district of Craven, from whence different streams proceed, which run through Yorkshire and Lancashire into the eastern and western seas. In No. 310 of the same Transactions, is an account of two remarkable parishes by Mr. Plaxton; which shall be given in his own words. "Anno 1673," says Mr. P. "I was presented to the

vicarage of Sheriff-Hales, and also to the rectory of Kinnardsey: the former in the counties of Salop and Staffordshire, the other wholly in Shropshire. November 6, I was inducted into the parsonage of Kinnardsey, where I was incumbent for thirty years and upwards. At my induction I found a great many aged people in the parish, upon which I took the number of the inhabitants, and found that every sixth soul was sixty years of age and upwards; some were eighty-five, and some were ninety. This I could not but wonder at, considering that the town was surrounded with a large morass, overflowed in winter, and that you could not come into the parish any way upon arable land."—"As to my rectory of Donington, to which I was presented anno 1690, I found there as many old people as I did at Kinnardsey, if not more; and in the two parishes I had but a difference of three in the number of the people. At Kinnardsey I had one hundred and thirty-five souls, at Do-

nington one hundred and thirty-eight; of the one hundred and thirty-five I had twenty-three aged sixty and upwards; of the one-hundred and thirty-eight, twenty-four."—"The people here live to great ages; I saw in one house three healthful people, whose ages numbered together made two hundred and seventy-eight, and I think they lived some years after; they were the man and his wife and his wife's brother."

"I was at Donington about thirteen years and some months; and in all that time I buried but twenty-seven people, of which number four came from neighbouring parishes, four were young ones, and of the remaining nineteen the youngest was about sixty, and the oldest ninety-six years of age. I was there the fourth legal incumbent in succession from the reformation; and as I remember at one triennial visitation of the bishop we had neither burial or wedding to return into the registry

at Litchfield. The country is very healthful in those parts, and though it seems to the eye of a traveller to be but of a moderate height, yet in riding between Donington and Wolverhampton, which is but five miles, you cross four rills or brooks in the compass of three miles, two of which run into the south-west seas, to Severn and Bristol; the other two hasten to the Trent and Humber, and so into the northen ocean."

I have no means of knowing the exact elevation of these places. The position of Donington, at the sources of two rivers which run a lengthened course into opposite seas, is sufficient to shew that its elevation must be great; and from the situation of Kinnardsey, it cannot be judged much inferior; notwithstanding the morass which Mr. Plaxton found so difficult to reconcile with the facts he was detailing. The localities of this parish are peculiarly instructive; and place in a strong

light the effect of elevation in prolonging life, notwithstanding the existence of causes which have been supposed capable of shortening it. They serve in fact strikingly to shew, that the reasons which have been assigned for the inferior average of life in low, and fenny tracts, are not the only ones.

The annexed table exhibits the results of inquiries made in some parishes in my own neighbourhood. They are deduced from tables of observation for ten, twelve, and eighteen years; and when connected with the peculiar natural situation of the parishes, forcibly illustrate the effect of that situation on the longevity of their inhabitants.—It may here be observed again, that in the estimate of the elevations, the inhabited surface only is included; without regard to elevated points not inhabited; and it will be understood that in each parish there must be inhabited parts at greater elevations than those given in the table.

Thus at Kilmington, the church and a group of houses adjoining, are nearly nine hundred feet above the sea ; and several detached cottages are still higher.

TABLE.

Place.	Population.	Mean Elevation in Feet.	Annual Mortality.	Mean Life.*	Probability of Life.	Number who exceed 70 years of age.
Maiden Bradley . . .	500	750	1 in 45	38½	38	1 in 3.50
Stourton	600	750	1 in 60	42½	45	1 in 3.12
Leigh upon Mendip . .	750	790	1 in 60	45.8	53	1 in 3.08
Kilmington	600	825	1 in 61	44	48	1 in 2.97

* For the information of those not conversant with such inquiries, it may be stated, that the *mean life* expresses the sum of all the ages equally divided, and is the same as the expectation of life in an infant at birth. The *probability of life* implies the age to which half of the born live.

The parish of Maiden Bradly in which the general duration of life appears to be so much inferior to the others, is perhaps the most instructive for our present purpose of all. The higher rate of mortality, and reduced average of life, depend on the unusual number who perish in infancy; nearly one-third of all that are born dying under two years of age; while in the adjoining parish of Kilmington the proportion who die under the same age, is only one-ninth. This enormous disparity in the mortality of infants in contiguous parishes, bespeaks something wrong in the one in which the excess appears. One is naturally led to expect the existence either of a great degree of moral degradation, or of the most abject poverty; the children must experience neglect from indifference or from want. Yet as if to place in the strongest light the effect of situation in prolonging life, notwithstanding this unfavorable outset, as soon as the dangers and the helplessness of infancy are passed, the child is

likely to attain an advanced age. The probability of life which at birth is only thirty-eight years, at two years of age rises to fifty-five; and the number who exceed seventy is not much inferior to that of the other three parishes.

The expectation of life, at birth, is at

London	North-ampton	Holy Cross in shropshire	In the Pays de Vaud.	Maiden Bradley.	Stourton.	Kilming-ton.	Leigh upon Mendip.
18 Years.	25	33¼	37	38½	42½	44	45·8

The dangerous age in elevated situations is the consumptive one; that passed, the probabilities of life will be found not to have decreased in proportion to the increase of years. This age may be supposed to be nearly that which constitutes the probability of life at birth; and will be found at Kilmington to be forty-eight. The inhabitant of this parish

who attains this age, has an equal chance of living to be seventy-seven.

The proportions of one in sixty, and one in sixty-one for the annual rate of mortality in the parishes above mentioned, would not, if taken by themselves, infer any extraordinary degree of healthiness, when compared with the reputed rate of mortality in some other places, and even in whole counties. But such a mode of computation is certainly not to be depended upon. Various causes which have been already enumerated, conspire to invest it with inaccuracies, and to lead to a computed rate of mortality much below the truth. From these sources of error, calculations founded on the probabilities and expectations of life at different ages, and the proportion in a given number who exceed the ordinary age of man, must be free, and their results in all cases correct. I can have no hesitation in saying that the returns which give to whole counties a mortality of

one in seventy, and one in seventy-three, must from some of the causes mentioned, be very far from the truth: and I am confirmed in my suspicions by comparing these counties with their neighbouring ones. It is for instance, quite inconceivable that the rate of mortality for the whole of Cardiganshire should be as low as one in seventy, and according to some, one in seventy-three, while in the adjoining county of Radnor with no obvious cause for such a difference it is as high as one in fifty-five. And it is still more extraordinary that in Glamorganshire, which like Cardigan has a long maritime border; which like it too from a high and mountainous interior, sinks into a level towards the coast, and with no great difference in the proportion of its town and country population,—I say it is still more extraordinary that there should be found such an enormous disparity as an annual rate of mortality of one in fifty-one. There can be no doubt from the causes before-mentioned, as well perhaps as

from others, that nearly all the calculations framed from the population returns give a rate of mortality much too low. Where such a low rate does really exist, it must depend, not upon a general superior duration of life after a certain age; but on the rearing a greater number of infants; which will often depend on causes not at all connected with the subject of the present inquiry. Thus in the parish of Maiden Bradly where the annual mortality on an average of eighteen years, is as high as one in forty-five, the general duration of life after the first years of infancy, and the number who attain the advanced age of seventy, are nearly as great as in the parishes of Leigh and Stourton, where the rate of mortality is only one in sixty.*

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* Since this Treatise has been in the press, Dr. Walker, of Huddersfield, has published an interesting account of the medical topography of that town, in No. 55, of the Medical Repository.

The general duration of life, and the proportion of old people in the parishes given above, are certainly very great, especially at Kilmington, which I should think may vie with most parishes in the kingdom for the health and longevity of its inhabitants. More than a third of all that are born living to exceed seventy years of age, or what may appear still more remarkable, two in seven arriving at the age of seventy five, are examples of general

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It appears from a table of mortality, for five years, contained in this account, that the probability of life, at Huddersfield, does not exceed ten years; and the number who attain the age of seventy, is about one in ten and a half: yet, according to the same table, which is taken from the parish register, the annual number of deaths is one in fifty-four only, certainly far below the truth, and affording another proof of the perfect inadequacy of this mode of computation, to give a just measure of the absolute degree of health enjoyed by any particular place; although a tolerable estimate may perhaps be formed in this manner, of the relative healthiness of country parishes, towns, or counties, when compared respectively with each other.

longevity, quite unequalled by any returns which I have met with for any part of this country. As a contrast to this parish, may be given the statements of two parishes in Holland, containing a population of two thousand seven hundred and twenty-eight; in which number there was not one above eighty-five, and only four above eighty.*

From these concurrent reports, collected from different countries, dissimilar in climate, in habits, and in government; the influence of elevation on the duration of life, independent of all other causes, appears to be satisfactorily demonstrated. The great age to which the inhabitants of mountains frequently live, has often been noticed, and has been generally ascribed to the purity of the air in such regions: but the existence of any such difference in the

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* Further discoveries concerning the state of the human pecies, by Nicholas Struyck, published at Amsterdam in 1723.

air of mountains is at the best problematical. The most celebrated chemists have been unable to discover any difference in the component parts of the atmosphere, taken from different situations. Berthollet found the proportions the same in Egypt and in France. Dr. Thomson found them the same at Edinburgh at all seasons of the year: and Gay Lussac examined air brought from the height of twenty one thousand feet above Paris, and found it precisely the same as the air at the earth's surface; nor does it appear that an increased purity of the atmosphere would be so congenial to human life as has been supposed. It is well known, that the effect of inhaling an atmosphere with a superabundant proportion of oxygene, is to produce a state of morbid excitement, and greatly to quicken the circulation. And so, says the hasty objector according to what has been advanced, does a lightened atmosphere: but there is a wide difference between an aided

and a stimulated circulation; between the increased action effected by external and mechanical means, and that produced by internal stimuli. In the one case, the *materia motûs*, (or what is the same thing, the removal of resistance,) is supplied from without, and calls for no additional exertion of the powers of life. In the other, the same motive principle, and the same effect, are to be produced by direct sensorial excitement, and increased labour of the vital powers. In the feverish and inebriating excitement of the one, the powers of life are too quickly exhausted. In the other, they are assisted in their labours, and enabled to maintain them for a longer period.

I cannot better illustrate this part of my subject than by the following quotations from the Croonian Lecture by Dr. Wollaston. "The circulation is helped forward by every degree of gentle agitation. The heart is

supported in any laborious effort that may have become necessary, by some obstacle to its exertions; it is assisted in the great work of restoring a system which has recently struggled with some violent attack; or it is allowed as it were to rest from a labour, to which it is unequal, when the powers of life are nearly exhausted by any lingering disorder."—" In the relief thus afforded to an organ so essential to life, all other vital functions must necessarily participate; and the various offices of secretion and assimilation, by whatever means they are performed, will not fail to be promoted during such comparative repose from laborious exertion."—" If vigour can, in any instance be directly given, a man may certainly be said to receive it in the most direct mode, when the important service of propelling forward the circulation of his blood is performed for him by external means. The main spring or first mover of the system is thereby, as it were, directly wound up; and although the several

subordinate operations of so complicated a machine cannot be regulated in detail, by mere external agency, they must each be performed with greater freedom, in consequence of this general supply of power."

These remarks are *mutatis mutandis*, precisely applicable to our subject; where, if the functions of life are not assisted by a direct supply of power, it is indirectly imparted by the removal of resistance to their freedom of action: labour is lessened, and the same degree of power is thus enabled to act with increased vigour and facility.

We will suppose that in a healthy person, with a weight of atmosphere equal to thirty inches of mercury, the actions of the system, and the resistance opposed to them, are in exact balance. But if a portion of this weight, equal to one inch of mercury,* be suddenly

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* About twelve hundred pounds.

taken away; or, which is the same thing, if we ascend a thousand feet in the atmosphere, there will be an exuberance of power in the vital functions, which will, for a time, be performed with quickened movements and augmented force. It will further follow, that the same change which thus carries the actions of the healthy person too high, will only bring those of the invalid, whose vital force is reduced by recent disease, up to the level of health; and will be precisely the same thing to him as a positive acquisition of strength, and may materially advance the slow steps of convalescence.* How long it may be before the wonted balance is again restored in the system of the healthy person, it may be difficult to ascertain; probably not long. The functions of life, in a state of health, quickly adapt themselves to the exigencies of every occasion;

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* The reader will recollect what has been said of the hill of Montmorency.

and in the present case the vital power will soon come to measure its exertions by the scale of resistance, and both regain an exact equilibrium. It does not appear that the pulse of the mountaineer beats any quicker, or that his respiration is more hurried than in the inhabitant of the plain; but the heart has much less labour to perform to maintain the very same actions.

It will readily appear to what use this knowledge is to be applied. Although we can no more controul the fluctuations of the atmosphere than we can those of the sea, we may lesson its weight at pleasure by mounting into higher regions. The convalescent from lingering disease who is seeking advantage from change of air, may derive essential advantage by bearing this in mind, and removing for a time to a more elevated site, provided he has no disease of the lungs. Every one is aware how much the renovation of strength, wasted

by disease, is promoted by exercise, especially of the passive kind. This salutary operation of exercise is the effect of the mechanical aid given to the circulation, by which the heart is relieved for a time of part of its labour; but the weakness may be such, or the season of the year so unpropitious, as to admit of no exercise. In either case, a removal to a higher situation is of still greater importance. The want of exercise is thus remedied, for the same thing takes place without it. The circulation and other functions of the system, are not indeed aided by any direct supply of power; but power is indirectly imparted, as was said before, by the removal of resistance to its freedom of action.

The case of the old man is the same as that of the youthful invalid, with this difference:— that in the one the spring of life is yet unbroken, and the parts of the machine are all in good condition; but in the other there is

no reactive power which can rise superior to the obstacles opposed to it. The main spring is weakened, and the wheels are all clogged, and move heavily. The object here is, by taking off a part of the load, to enable the vital power, enfeebled by the labour of accumulated years, to maintain a little longer the sluggish actions of its worn out machine. A short residence in an elevated place may be sufficient to invigorate the young convalescent; but that of the old man must be more permanent. He may perhaps quit it occasionally for a short time with impunity but he must consider it as his residence, where nine-tenths of his time are to be spent. Above all, those who have passed the whole, or the greater part of a long life, in an elevated situation, should be cautious of quitting it to reside in a lower one. If lightening the atmospheric load can give fresh vigour to the vital actions, and thus prolong life,—increasing it must necessarily by depressing them shorten

it. The lives of old Parr and John Jacobs soon terminated after quitting their native hills; the one of Jura, and the other of Shropshire.

The difference in the rates of mortality in different countries, has been attributed to the relative proportion which the inhabitants of the country, and of the towns bear to each other: and Sussmilch has gone so far as to fix the rate for every country according to these proportions. The difference in the rate in different parts of the same country, has by common opinion been assigned to causes emanating from certain properties of the soil, or to certain other supposed peculiarities of the air. With respect to the first part of this argument, or as it applies to countries at large, it will be sufficient to compare the two kingdoms of Great Britain and Sweden; when it will be seen that although the proportion of the town to the country population is incom-

parably greater in the first then in the last, the rate of mortality is considerably lower. With respect to the causes more strictly local, or those which produce a disparity in the rate of mortality in different and even adjoining parts of the same country,—those which are supposed to belong to the atmosphere, and to which the superior healthfulness of certain situations has been attributed, have been already examined: and of those which are supposed to emanate from the soil, and whose properties are conceived to be inimical to human life, especially from the soil of marshes, the parish of Kinnardsey, without disputing the existence of such properties, must shake our belief in their sole efficiency to the end assigned: at least in temperate climates. In corroboration of the doubt here expressed, it may be added, that M. Muret, in his inquiries in the Pays de Vaud, found that the duration of life amongst the inhabitants of a low and marshy plain was greatly below that of the

inhabitants of the mountainous parishes. Yet although this plain is low when compared with the neighbouring mountains, as its elevation is considerable, the probability of life amongst its inhabitants is much above that of the Lyonois, consisting of a varied surface but situated at a much lower level.

The preceding observations must of course apply to every description of local insurance, whether in the shape of benefit societies, tontines, or of any other. Dr. Price recommends as a relief to the poor's rate the establishment of parochial societies, under trust of the parish officers, for granting annuities, to commence at a certain age. It is obvious that the calculations upon which these, or any other institutions of the kind must be founded, would differ greatly in different parishes; and I have endeavoured to point out a cause for this difference more certain and general in its application than any of those arising from the

qualities of the soil, or the distribution of the inhabitants. In the great scale on which our Assurance Societies conduct their affairs, the difference is not felt of so much consequence: their calculations being founded on a general average of the whole kingdom, and the defect of life in one district being made up by its excess in another. But if it were otherwise—if the provincial societies were confined in their transactions to their respective divisions of the kingdom—if for instance, the Norwich, and the West of England Societies were limited wholly the one to the eastern, and the other to the western counties, and both were to calculate from the same tables, and consequently to grant insurances at the same rate of premium, a difference in their funds would soon become apparent; and the eventual probability would be, that the one would be able to make a large dividend, and the other become insolvent. As matters stand now, the inhabitants of the west, besides paying for themselves,

assist in paying for those of the east. If a society were formed which should confine its actions to the western and midland counties, that is to say, from the benefits of which the counties of Sussex, Surry, Kent, Middlesex, Essex, Cambridge, Huntingdon, Bedford, Lincoln, Norfolk and Suffolk should be excluded, it could afford to effect its insurances at a rate of premium from one-eighteenth to one-fifteenth lower than at present; or one-sixth below that which another society could possibly effect, confined to the counties above mentioned.

The influence of temperature and of the seasons, bears equally on this, as on the first part of the present inquiry; and a few pages may with propriety be devoted to an examination of the opinions respecting the action of cold on the human body. The popular prejudice in its favour, the fatal error to which a mistaken judgment on this subject may lead,

and the disputed opinions entertained by medical and other writers respecting it, conspire to render it a question of peculiar interest, and its solution of the first importance. The interesting paper of Dr. Heberden, on the comparative mortality of the winters of the years 1795 and 1796; the one the coldest, and the other the mildest, which have been known to occur in this country, placed in a new and forcible light the destructive agency of cold. In January 1795, the whole mortality was nearly twice as great; and the number who died above sixty, five times as great as in the same month the following year. One would suppose that this fact alone would be sufficient to convince the most incredulous on such a subject. But every day's experience tells us that no such conviction has taken place; and there are still not wanting public advocates for the healthfulness of cold. Amongst these is an eminent writer on annuities and assurances; and as the doctrines

advanced by that gentleman on this subject are the most popular, and from their imposing aspect, and the high respectability of the work in which they are conveyed, are calculated to mislead ;—I trust no other apology can be necessary for examining the validity of the evidence upon which they rest, and exposing the fallacy of the conclusions drawn from it.

Mr. Milne, in his elaborate work above referred to, has endeavoured to defend the prevailing prejudice in favor of the healthfulness of cold, and supports his opinion chiefly by tables of mortality for all the months of the year, in some of the northern parts of Europe, from which he concludes, that " no support is given to the doctrine which has been maintained of late by some eminent physicians, that frosty weather increases the general mortality ;" but that, " they rather seem to favor the opposite opinion which has generally prevailed." The same form of

tables used by Dr. Heberden are afterwards given, and extended to subsequent years. The increase and diminution in the rate of mortality, with that of the degree of cold which these tables shew, are endeavoured to be accounted for upon other principles. But with the full admission of these principles, the tables themselves still stand as unanswerable arguments for the truth of the position, that cold is unfriendly to human life, especially in the aged.

The following are the results of the tables alluded to :

Years.	Mean temperature of first five weeks.	Whole number of Deaths.	Aged above Sixty.
1794	37½	2600	473
1795	26½	2823	717
1796	47	1471	153
1799	36	2204	389
1800	41	3014	699
1801	43½	2064	380
1802	37	2305	385
1813	36½	1977	408
1814	29	2149	526

The preceding argument is illustrated by a comparison of the years 1794 and 1796; of which it is observed, that though there was hardly any frost in the first five weeks of 1794, and the price of bread then was only about half what it was in the corresponding part of 1796; the total number of deaths was nearly twice as great; the number that died above sixty was three times as great, &c.— And so it should be; for notwithstanding the absence of frost, there is a difference of almost ten degrees between the average temperature in the same period of the two years, which is nearly the full difference in the winter temperature between London and Lisbon.

It is further contended, and doubtless with truth, that the number of deaths in 1796, especially amongst the infirm, was greatly lessened by the havoc which the cold of the preceding winter had made amongst them, and

there being in consequence fewer persons of that description amongst the living in January 1796 than ordinary. But besides this being a very sufficient acknowledgement of the effects of the cold of that month; to give the argument the weight demanded for it, it should be found to be retrospective also: but the mortality of January 1794, even exceeded that of ordinary winters.

Mr. M. further observes, "It is manifest that the excessive cold in January 1795 increased the mortality considerably, though not so much as has generally been believed; but admitting that an intense frost increases the general mortality, it does not therefore follow that a moderate degree of it, such as we commonly have in England in the depth of winter does so. Our clothing and habitations are only adapted to protect us against the common inclemencies of the weather; therefore when

we happen to be visited by a winter of uncommon severity, many of the people must suffer, not so much because that degree of cold is unfavourable to life, as on account of our houses and clothing being too slight." One should imagine that this supposed difference can only have originated in an unphilosophical idea of the operation of cold. Cold in itself is a negative property; and its effects on the living body are produced only by its conveying away the animal heat. If in the case of an extreme degree of cold the heat is carried off faster than the powers of life can reproduce it, death ie speedily the consequence; or in a lesser but longer continued cold, the vital powers gradually sink under the labour imposed on them, and fatal disease, more protracted indeed, but not less certain is the consequence. It matters but little in this view of the action of cold, whether the same quantity of heat is conveyed away by an extreme degree of cold with warm clothing, or by a less severe one with clothes of

a lighter and less defensive quality. In either case, it is equally the action of cold which produces effects unfavourable to life.

The assertion that a moderate degree of cold, such as we experience in ordinary winters in England has no influence on the general mortality, is fully disproved by the invariable results of the bills of mortality in this country, as well as in other parts of Europe. The statements and observations of Dr. Short, Dr. Price, Dr. Heberden, and Dr. Woollcombe, make the proportional mortality of the winter and summer months, in this country and in other parts of Northen Europe, as about thirteen to ten.* And as far as the aged, and indeed all above middle life are concerned, every year shews a progressive decrease in the number of deaths from January to July.

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* Summer includes June, July, August, and September. Winter, December, January, Feburary, and March.

The monthly bills of mortality for Sweden, Russia, and England, would seem indeed on a prima facie inspection, to warrant the conclusions which have been already noticed as having been drawn from them. By these bills it appears, that the intensity of mortality does not reach its maximum till the severity of cold has passed. The greatest number of deaths in Sweden and Russia being in May, and in England in April; and the fact undoubtedly invests our argument with an apparent difficulty; but it is only apparent. There are several causes whose combined operation will satisfactorily account for the excess of mortality in the spring months, all of which, immediately or remotely owe their birth to the existing or the preceding cold.

Towards the close of winter, and commencement of spring, the cold, although it begins to relent in its severity, may be said to preserve in kind what it loses in degree. It is not till the sun advances high in the ecliptic that

the polar air moves with permanence and velocity southwards: and although its temperature is somewhat raised, its keen severity is much more sensibly felt, and often much more fatal in its effects. This will easily be understood when it is recollected that a heated body cools with much greater rapidity in a brisk wind, than when the atmosphere is calm and of the same temperature; and the human body will experience a much more painful feeling of cold, and will have to furnish a greater supply of caloric in a March wind, with the thermometer ten degrees above the freezing point, than in a still day in January when it is ten below it: neither will its influence be confined to the feelings. The intensity of the application in the one case, exceeds the degree of cold in the other; and more heat will be carried off from the surface of the body under such circumstances, by an equal exposure, with the thermometer at forty-two, than in others at twenty-two. The ex-

treme dryness of these winds, and their rapid subtraction of the moisture, as well as of the heat of the body, increases their cooling power. Dr. Hutton, of Edinburgh, found that a wetted thermometer, exposed to a moderate east wind in the month of March or April, sunk between eight and nine degrees below the temperature of the air: but in the dryest summer weather, it never fell more than four, and often only two or three.* But these are not the only reasons why there should be no reduction in the bills of mortality in the spring months in northern climates.

The inhabitants of Russia and Sweden, from whom this argument is principally taken, notwithstanding the greater severity of the cold in those countries, pass the winter months in an average temperature, nearly as high as that of

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* Dissertations in Natural Philosophy, p. 155.

the inhabitants of the comparatively mild climate of Great Britain. The Swede and the Russian are at great pains to preserve a regulated, and even a high temperature, in their apartments. But the English stove affords a very scanty and partial heat to a large room; and even if the day has been spent in a room sufficiently heated, the most wealthy not unfrequently retire to sleep in another where it is actually freezing.

Another cause which may be assigned for the increase in the rate of mortality in the spring months is, that the effect of any cause operating upon a living body, is not limited to the duration of the cause itself; and much of the evil effect of cold may not be apparent till its intensity is somewhat on the decline. The long continuance too of severe cold may destroy many who could have resisted it for a shorter season. Now there is very little mitigation in the extremity of the weather in Russia or Sweden till the month of April; and even this

month at St. Petersburgh is rather below the average temperature for January in London.

Another cause which acts as a check to any reduction of mortality amongst the aged and infirm in the spring months is, that there is a more general exposure to the cold winds, which in spite of a warm sun, often prevail in these months. Those who have scarcely stirred abroad the whole winter, now think the danger past, and that they may venture out in safety. The brilliance of the light, and the genial feeling of warmth which the sun now diffuses, are with difficulty associated with the idea of a freezing atmosphere. The invalid is tempted forth to meet death in the breeze; and the old man confiding in his strength, throws off, perhaps, his upper garment when he most requires it.

But there is yet another cause, probably more extensive then either of the former,

TABLE.

Age.	EXPECTATIONS OF LIFE AT THAT AGE.		
	In Sweden.	At Carlisle.	At Montpellier.
60	12·85	14·34	14·59
65	10·19	11·79	12.28
70	8·01	9·18	10·07
75	6·27	7·01	8·05
80	4·85	5·51	6·02
85	3·84	4·12	4·21
90	3·03	3·28	3·76
95	1·76	3·53	3·47
100	—	2·28	2·56

It may be hoped that the facts contained in this table, will set the argument which refers us to the north for instances of health, and longevity, for ever at rest; and that it will, together with the other facts detailed, assist in removing the prevailing prejudice in favour of what is termed a healthy and bracing cold; for which all are ready to contend. The aged

especially, are slow to be convinced that what they have considered as the healthy practice of a long life, can at any period of it acquire a contrary power. Their own invigorated feelings, and the examples of some selected individuals, who, with similar habits have attained an advanced age, are confidently opposed to every description of advice on this subject. But this is the ready argument for every species of habitual imprudence; and can avail nothing against a host of contrary evidence. The powers of life are called into extraordinary exertion to maintain the vital heat rapidly carried off by a cold atmosphere. The effect of this increased action of the vital powers, is to give a delusive feeling of vigour; which if not pushed too far, all is well. Youth may draw largely upon the fund of life; may goad its powers to almost any degree of action, and sustain the rigours of climate with impunity. But it is otherwise with age. The

infant and the old man like exotic plants require the fostering care of the nurseryman for their preservation. The first is not steeled to the inclemencies of its new climate:—the last has expended his powers in contending against them. Exposure to cold may indeed produce grateful and bracing feelings; temporary vigour accompanies them; but life pays the forfeit. They lead not to health and strength, but to exhaustion and death.

This may be considered as the proper place for observing, that although the age of sixty has been taken as that at which the influence of cold becomes most conspicuous, we must go back yet many years to affix the period when cold first acquires a marked destructive power over the functions, and the duration of life. It appears from the bills of mortality, that after the first years of infancy, forty is the age at which the number of deaths begin sensibly

to increase with the accession of cold.* He who has passed that age will do well to bear this fact in mind, and to recollect, that although he experience no sensible decay of vigour, and thinks he may yet rejoice in the strength of his youth,—the insusceptibility, and the impenetrable hardihood of that season, are going by; and if he continues fearlessly to encounter the pelting storm, or northern blast, he may in evil hour have cause to repent of his temerity.

It has already been established as an inference resulting from the preceding inquiries, that the duration of life is proportioned to the

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* The bills of mortality for the year 1814 will sufficiently illustrate this fact. The number of deaths between forty and fifty in the first half of that year were, in

January	228	April	176
February	185	May	136
March	189	June	112

elevation of the country or spot inhabited. I trust also that it has been satisfactorily proved, that the action of cold is unfriendly to human life, especially in its advanced stages; and we come now to derive from this knowledge, a second inference of equal importance; namely, that the duration of life is also proportioned to the temperature of the country or spot inhabited. The union of these two important deductions leads us to the conclusion which was proposed as the final object of these inquiries; namely, that the fittest residence for the aged and the invalid, is that, where elevation can be united with mildness of temperature.

> Ver ubi longum, tepidasque præbet
> Jupiter brumas.

It is evident that we must look beyond our own country, for situations where this object may be obtained through the greater part of the year; but they are comparatively very few,

whom fortune has gifted with the means of seeking better climates; and of those few, still fewer will perhaps feel disposed at a late period of life to encounter the inconveniences of a voyage, or a journey, and to quit for ever the scenes and the friends of their youth, to pass the remainder of a lengthened life far from both. Such may seek shelter in the south-western counties of this island; whose milder air, and bold elevations, afford an infinite variety of situations answering the object desired; where with warm houses, and warm clothing, during the inclement season, and the nameless comforts of an English fire-side, which are to be found no where else, the want of a more genial climate need not be regretted. Amongst the situations which together with these advantages, possess in an eminent degree those of society, &c.: the higher parts of Bath and Clifton may be particularized, the former especially; where on the southern declivity of Lansdown, at an elevation of five or six

hundred feet, there is still a sufficient rise beyond, to form a protection towards the north.

Of all the foreign situations with which we are well acquainted, the Island of Madeira, which has been excepted against as a residence for the consumptive, is perhaps the best; where at an elevation of from one to two thousand feet, (and a greater is perhaps not desirable for a native of England) every advantage of situation and climate may be enjoyed.

I cannot close these remarks, without again expressing a hope, that those who possess the required local advantages, will be at the pains to collect, and to publish, such observations as may throw light on the inquiry here set on foot, as regards the local prevalence of particular diseases; and especially of consumption. Every fact has its weight, and may boast of having its share too, in rescuing from some

portion of suffering, perhaps from death, the devoted victim of a merciless disease. No class of men have such extensive opportunities of doing good as those engaged in the practice of medicine: and it may afford some consolation, and some encouragement to those who are silently, and unostentatiously pursuing their arduous career, that the field of discovery and of improvement is open to all. No one knows what it may fall to his lot to effectuate; or how far the boundaries of his science may be extended by his individual means. The contribution of a single fact, or observation, is worth a volume of theories unsupported by either; and is in reality greater gain to the science of medicine, than can perhaps be said of any other. It may here be said with truth, that, "The conquests of fancy are made in regions which cannot be rendered immediately productive;" but "when the boundaries of the empire of science are enlarged, we can till the territory as it is gained, step by step, and the

harvest heaps itself on the floor of the granary."

I am aware that the habits, and engagements of medical men involved in the daily and nightly whirl of extensive practice, are exceedingly adverse to inquiries not immediately connected with their routine pursuits. But there are no limits set to the operations of an active mind; and, under every disadvantage, it will command opportunities of effecting its purpose.—It is true, the science of medicine holds out few rewards to its votaries but those of an approving conscience: but let him who feels disinclined for additional exertion, recollect that the time fast approaches when every man's labour shall cease, and life with all its ordinary pursuits, be as "the vapour which appeareth for a little time, and then vanisheth away:" but the labour of the philanthropist, especially of the medical one, ends not thus. "The benevolence of the great,

or the opulent, however eminent it may be, perishes with themselves. The benevolence even of sovereigns, is often limited to the narrow boundary of human life; but the benevolence of knowledge is of a kind as extensive as the race of man, and as permanent as the existence of society." And what benevolence or knowledge can equal in extent or permanence that of medical science, which is of all others unquestionably the most useful? He who has laboured in its service has not laboured in vain. Whither he goes, thither will his reward go with him; and the good which he has effected shall outlive him, though the memory of it be interred with his bones: "Et profecto, si hominibus unquam liceret gloriari, certe de hoc maxime gloriandum esset, tantum scilicet profecisse genus suum, et tam præclarum tamque perenne existere ingenii humani monumentum."

THE END.

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