

A guide to the choice of a site for residential purposes : high-lying, dry sites remedial and preventive of disease, and promotive of health and the enjoyment of life, from the evidence of a wide range of eminent authorities in therapeutics, climatology, etc. : considerations founded on geological facts and the benefits derived from residence on high-lying sites on the chalk, which alone, of all sub-soils in the Home Counties, can always be relied upon for dryness, even in an elevated situation / by a member of the Geologists' Association.

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A GUIDE
TO THE
CHOICE OF A SITE
FOR
RESIDENTIAL PURPOSES.

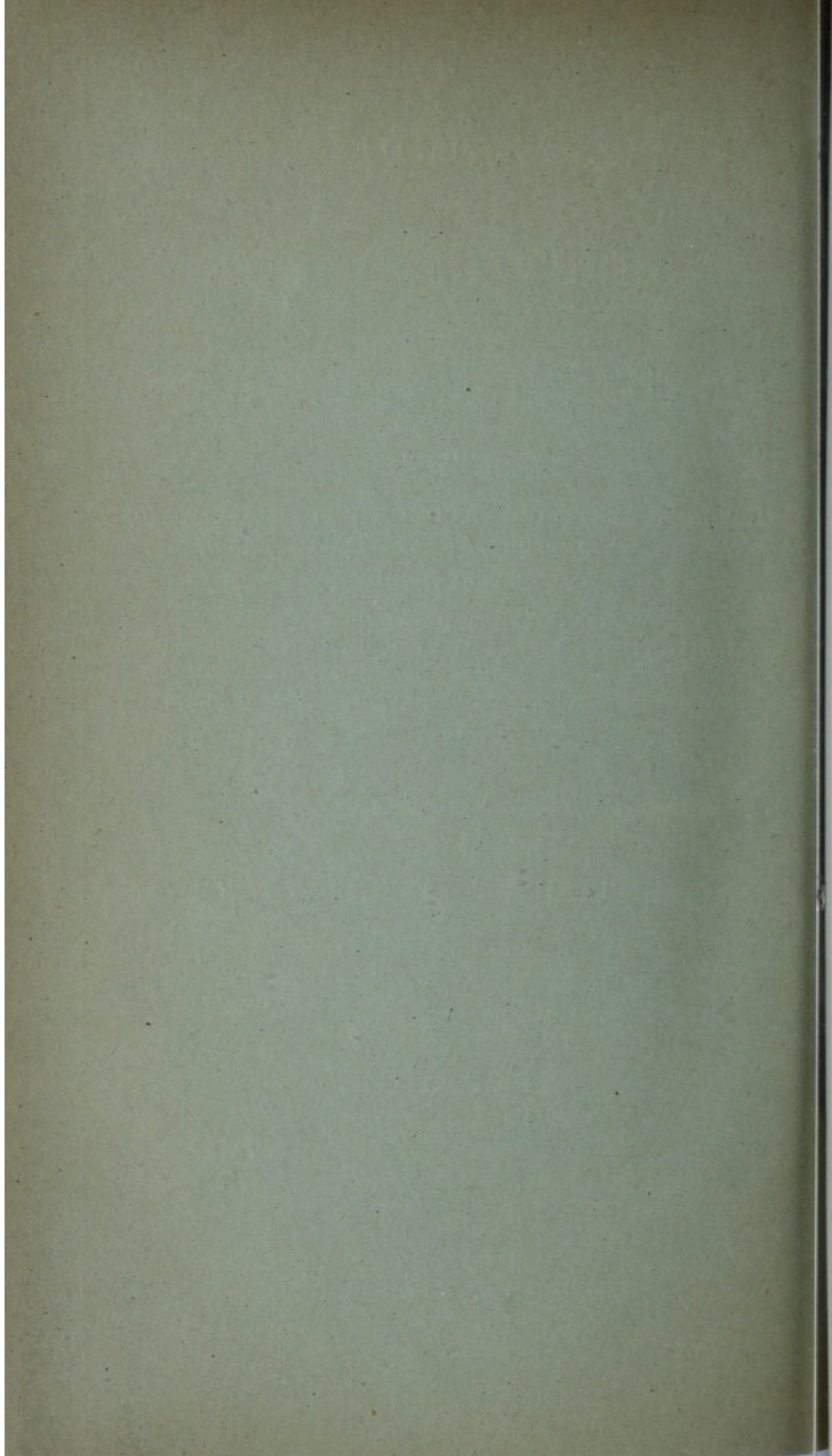
HIGH-LYING, DRY SITES REMEDIAL AND PREVENTIVE OF
DISEASE, AND PROMOTIVE OF HEALTH AND THE
ENJOYMENT OF LIFE.

DEDUCED FROM THE EVIDENCE OF A WIDE RANGE OF EMINENT
AUTHORITIES IN THERAPEUTICS, CLIMATOLOGY, ETC., FROM CONSIDER-
ATIONS FOUNDED ON GEOLOGICAL FACTS AND FROM THE BENEFITS
DERIVED FROM RESIDENCE ON HIGH-LYING SITES ON THE CHALK.

BY A MEMBER
OF THE
GEOLOGISTS' ASSOCIATION.

SIXPENCE.

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Surrey, or of H. SUTTON, Printer, Station Road, Redhill.



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REDHILL:
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1887.

Is life worth living? Experience is invariably responsive in the affirmative, when life is lived for Christ, and therefore for our fellow-creatures. Yet even that highest kind of life is more healthy and enjoyable when lived under circumstances counteractive of disease and favourable to bodily health.

HIGH-LYING DRY SITES REMEDIAL AND PREVENTIVE
OF DISEASE, AND PROMOTIVE OF HEALTH AND
THE ENJOYMENT OF LIFE.

IT was remarked a short time ago, by a surveyor of considerable experience, that a great many people in London do not know what a clay soil is. We believe that is quite true, especially as regards its evil influence on climate, although many do know, and carefully avoid the clay districts comprised within the area of Greater London, and which not only show themselves to be clay by the predominance of the oak, and by their general flatness, but also by still remaining in pasture, unoccupied by houses, although only six or seven miles from the Bank. There are also numbers of people who do not know what a chalk soil is, nor its benign influence upon climate.

To such, and to all who desire to escape from the impure air of London, or from the discomfort and peril of some unfortunate choice of soil in the country, this compilation is respectfully dedicated, in the hope that it may serve to indicate the general principles that should guide them in their avoidance of the prejudicial and unsatisfactory districts, and in their search after a district or a site which will contribute to their health, excite pleasurable sensations, and prove a lasting satisfaction.

We propose, first, to demonstrate that high-lying sites are the best for residential purposes, and then as to the superior advantages of those lying on Chalk.

The Evils of Dampness of Soil and Climate.

"Rheumatism, heart-diseases, catarrhal affections, and ague are common in damp situations."—DR. MOSELEY.

"Negative electricity is mainly present during a humid state of the atmosphere; its relaxing and depressing effects are felt in damp coast situations, confined districts, and abnormally warm places."—DR. MOSELEY.

"I perfectly indorse what both Dr. Buchanan and Dr. Bowditch, of Boston, U.S., have emphatically urged in their respective papers, 'that dampness of soil is a grand exciting cause of phthisis.'"—DR. HAVILAND.

"Children, who are more susceptible than adults to local climatic causes, suffer sooner from fatigue on ill-drained clay than they do on a naturally drained soil."—DR. HAVILAND.

"Consumption is much more prevalent in those places in which a humid state of the atmosphere predominates than in drier localities."—DR. LEE.

"Dampness of soil induces rheumatism, bronchitis, colds and consumption."—DR. G. WILSON.

The Advantages of Dryness of Soil and Climate.

Greater extremes of heat or cold can be borne with comfort in a dry climate than in a damp one. The dry climates of Agra and Mooltan, where the heat even in the shade rises to 120°, are far more bearable than the moist climates of Calcutta and Bombay, where the thermometer seldom rises in the shade higher than 100°.

"In a healthy man, and in the ordinary state of insensible transpiration, a moderate degree of dryness of the air may cause an increase in the amount of this secretion six or seven times greater than in a state of extreme humidity. In an atmosphere saturated with humidity, the temperature of which is equal to that of the body, or above it, there would be no

aqueous exhalation from the lungs, because there would be no evaporation. A dry air causes perspiration to disappear by its property of absorbing humidity; a moist air, by the opposite property, allows it to accumulate on the surface of the body."—DR. LEE on *Climate*.

"Dry air favours the excretion of moisture from the lungs and from the surface of the skin by means of the insensible perspiration; this watery vapour carries with it a number of excrementitious principles, so that dry air plays an important part as a purifier, and helps the respiratory function when suffering in consequence of pulmonary disease. Dry air stimulates the digestive functions, and by exciting the action of the skin relieves the functions of the intestines; on the other hand, when the air is damp the digestive functions languish."—"Nice and its Climate," by DR. WEST.

"It is well known that the mortality from consumption is greatly diminished by residence on or removal to a dry subsoil, and as about one-seventh of all the deaths in England arise from tubercular diseases, the importance of this cannot be overstated; moreover, lands which permit of a rapid percolation of water are more healthy than those which emit all their water by evaporation, and thus give rise also to a diffusion of gases through the atmosphere which render it unwholesome."—DR. SCORESBY JACKSON on *Medical Climatology*.

The late Dr. Parr, of Betchworth, Surrey, formerly practiced at Southport, which is on a clay soil, and found that his cases, especially scrofulous diseases, which were always intractable at Southport, were invariably benefited, and nearly always cured, on removal to New Brighton, on a sandy soil. A professional friend of his had a daughter very ill of mesenteric consumption at Southport, and her father took her to New Brighton; immediately on her arrival there she became more cheerful, her appetite improved, and in a few days she was well.

A sandy soil is preferable to clay. A resident on

the Greensand at Reigate was always troubled with asthma in the moist climate of South Devon, and is free from it in the drier climate of Reigate.

"In regard to rainfall and pleasure-traffic, a very important question is, 'What is the character of the subsoil of a place?' A heavy rain on a porous soil may be much less of an inconvenience to foot-passengers and pleasure-seekers than a much smaller rainfall on a heavy clayey soil which the rain neither soaks through nor readily evaporates from."—DR. MOSELEY.

"Defective nutrition arising from exhausted vitality being at the root of consumption, the climatic question admits of little controversy; a cool, dry, sunny, and moderately stimulating climate is the one best adapted for restoring vitality and warmth."—DR. MOSELEY.

"If it be necessary in the eyes of the farmer that his fields should have a dry subsoil, that his crops may live and thrive on their surface, how much more obviously necessary is it that the ground on which our houses stand should be so dry that the people who live in those dwellings should be healthy and strong! The primary care of the man who is determined that his house shall be warm and dry, should be devoted to seeing that his site is naturally a dry one. Art and skill may do much to improve a malarious, a marshy, or a merely damp site, but such a piece of ground can never in the nature of things be so satisfactory as one which possesses a naturally dry subsoil."—*"Land," April 8, 1882.*

Elevated Sites are drier and warmer than lower Situations.

"Dampness, the especial bane of all delicate constitutions, should be guarded against by choosing a somewhat elevated situation upon a dry subsoil."—DR. SCORESBY JACKSON *on Medical Climatology.*

"It is easy to understand how the air of elevated districts must be drier than that of lower situations. In the first place, the lower the atmospheric pressure, the more rapid is the process of evaporation ; secondly, the energy of the sun's rays, and therefore their drying effect, on the atmosphere is greater the less the density and thickness of the layers of air they have to traverse."—DR. YEO *on Health Resorts*.

"The advantages of an elevated dwelling-place are proverbial,—pure air and dryness, uninterrupted sunlight, and freedom from the mists and vapours which trouble the dwellers in the valleys below."—" *Sussex Daily News*," May 23, 1884.

"The hill-slope is often both warmer and drier than the country immediately below, where the fogs form. It may be observed that dahlias, which perish with the first frost, are still flourishing on the high ground when their fellows in neighbouring gardens, lying lower down, are already black and withered. Even in lofty situations the cold is sometimes less sensible than in the plains far below. Some monks at the Grande Chartreuse, which is buried in snow for many months in the year, told me that on going to Lyons during the winter, the sensation of cold increases on approaching the town, although it lies several thousand feet below the convent."—DR. FRANCIS.

"At the foot of the Chalk range in Oxfordshire, the frost takes effect sooner and lingers longer than it does on the summit of the hills."—C. S. READ *on Farming of Oxfordshire*.

"It is a known fact, although possibly not so generally understood as it should be, that frosts are more biting in valleys than upon hills ; vegetation therefore is far more likely to suffer in the former than upon the latter, the reason undoubtedly being attributable to excess of moisture in the air in valleys ; frost being certain to lay hold of anything damp more firmly than anything dry."—" *Gardening*," Aug. 19, 1882.

"On passing through a depressed part of the road, on a tour of inspection, the coachman said, 'It's colder here than anywhere else on the road, a great-coat colder.' I replied that on

a still clear night cold air gathers in hollow places ; you often find more injury from frost in a valley than on the hill, and the cold is often sharper in the valley. On reaching a hill beyond the depression, we found it warmer."—" *Agricultural Gazette*," Dec. 5, 1881.

"Cold air being heavier than warm, the stratum next to the soil will, as a rule, be colder than the one above it. Hence land at the bottom of a valley will be chilled by the descent of cold air more than that higher up, so that what are called sheltered places are often in spring and autumn the coldest. The growth of the sheltered gardens in the Valley of the Thames has often been killed by frosts, whose effects were unfelt on the hills of Surrey and Middlesex."—DR. DAUBENY *on Climate*.

"At night, and in the winter when the sun is feeble in its influence, and the surface of the ground is cooled by radiation below the superincumbent air, the particles of air resting on the ground become cold by contact with it, and, increasing in density, descend the slopes of the downs and collect at the bottom of the coombes, displacing the warmer air ; creeping from the coombes as shallow streams of cold air of limited extent, they gather in the wider valleys, and the descent of cold air in this way through the valleys is counterbalanced by the ascent of the comparatively warm air which it displaces, so that the hills enjoy a somewhat higher temperature than they otherwise would. In Croydon, dahlias and scarlet-runners always last longer on the higher ground, and I have known the latter especially to be black and withered by frost on the lower ground weeks before they were touched on Parkhill, the highest ground in Croydon. Many half-hardy shrubs and valuable ornamental trees, I am persuaded, would stand with impunity the climate of Warlingham which would perish in some parts of the Caterham Valley."—MR. STORKS EATON, F.M.S., in *Paper read at Meeting of Croydon Natural History Society, April, 1881*.

In discussion on the same paper, Mr. Mawley said that Mr. Storks Eaton had proved that the atmosphere on

the hills was warmer than on the lower ground; and if he wanted a proof of that, he had only to go to Addington Hills, where vegetable gardens could be seen in a much better state than in Croydon. This he thought was owing to a better circulation of air on the hills, and its greater purity. Dr. Carpenter also said he had noticed that when the vegetation was cut off in the bottom of the valley, that on the hills was unharmed.

“As the air in contact with the declivities of hills and rising grounds becomes cool by contact with the cooled surface, it acquires greater density, and consequently flows down the slopes and accumulates on the low-lying ground at their base. It follows, therefore, that places on rising ground are never exposed to the full intensity of frosts at night; and the higher they are situated relatively to the immediately surrounding district, the less are they exposed, since their relative elevation provides a ready escape downwards for the cold air almost as speedily as it is produced. On the other hand, valleys surrounded by hills and high grounds not only retain their own cold of radiation, but also serve as reservoirs for the cold heavy air which pours down upon them from the neighbouring heights. Hence mist is frequently formed in low situations whilst adjoining eminences are clear. Along low-lying situations in the valleys of the Tweed and other rivers of Great Britain, laurels, araucarias, and other trees and shrubs were destroyed during the great frost of Christmas 1860, whereas the same species growing on relatively higher grounds escaped, thus showing by incontestable proof the great and rapid increase of temperature with height at places rising above the lower parts of the valleys. Though the space filled by the downflowing current of cold air in the bottom of a valley is of greater extent than the bed of a river, it is yet only a difference of degree, the space being in all cases limited and well defined, so that in rising above it in ascending the slope the increased warmth is readily felt, and, as we have seen, in extreme frosts the destruction to trees and shrubs is seen rapidly to diminish.”—“*Encyclopædia Britannica*,” new edition, 1877, article “*Climate*.”

"Recent observations have completely disproved the rule which only thirty or forty years ago was believed to represent the facts, that temperature decreases regularly with increasing altitude. Mr. Dines, in 1871, made observations at two stations, Cobham and Denbies; Cobham being situated close to the river Mole, 65 feet above the sea, and Denbies at an elevation of 610 feet, the two places being separated by a gradual slope of $6\frac{1}{4}$ miles. The mean of all the maxima for eighteen months was about $3^{\circ}.2$ less on the hill than in the valley, of all the minima about 1° higher. The hottest day produced $91^{\circ}.4$ at Cobham and $84^{\circ}.2$ at Denbies. The coldest night produced a minimum of $1^{\circ}.2$ at Cobham and of 14° at Denbies. The mean daily range at Cobham was 19° , and at Denbies $14^{\circ}.8$. Observations taken in Switzerland a few years ago showed that a much milder and more equable climate prevailed at a few hundred feet above the valleys than at the bottom."—HON. F. R. RUSSELL *on Improvement of Climate at slight Elevations.*

"On the 9th December, 1784, though the air was perfectly still, Dollond's glass went down to one degree below zero. This strange severity of the weather made me very desirous to know what degree of cold there might be in such an exalted and near situation as Newton; we had therefore, on the morning of the 10th, written to Mr. —, and entreated him to hang out his thermometer made by Adams, and to pay some attention to it morning and evening, expecting wonderful phenomena in so elevated a region, at two hundred feet or more above my house; but behold! on the 10th, at 11 at night, it was down only to 17° , and the next morning at 22° , when mine was at 10° ! We were so disturbed at this unexpected reverse of comparatively local cold that we sent one of my glasses up, thinking that at Newton must somehow be wrongly constructed; but when the instruments came to be confronted they went exactly together, so that for one night at least the cold at Newton was 18° less than at Selborne, and through the whole frost 10° or 12° . And indeed, when we came to observe consequences, we could readily credit this, for all my laurustinas, bays, ilexes, arbutuses,

cypresses, and even my Portugal laurels and (which occasions more regret) my fine sloping laurel hedge, were scorched up, while at Newton the same trees have not lost a leaf."—WHITE'S "*Selborne*," *Brown's edition, Letter 167*.

The Rev. Mr. Bree, of Allesley Rectory, made similar observations in 1830 and 1831. He says:—

"I have elsewhere observed in the year 1830 that the effects of the frosty nights on trees seemed to be most destructive in lower situations; several instances of the same kind presented themselves to my notice this season during the frosts that prevailed in May. The gooseberries and currants were in some cases much injured in gardens that lay low, while those in more elevated situations escaped unhurt."

"Two years ago you allowed me to remark in your columns on the extreme temperatures experienced in valleys compared with the hill-sides immediately adjoining. Yesterday's extreme frost gave another instance, for while at the vicarage on the hill-side the lowest was 3 degrees below zero, at Sorrelsykes House in the valley 9 degrees below zero was registered, and in a low pasture near the brook 13 degrees below zero. All the thermometers are good and in perfect order, and properly protected from radiation, four feet above the ground. At 9 a.m. the thermometer at Sorrelsykes stood at 8 degrees below zero; here, on the hill-side, 1 degree below."—REV. F. W. STOW, F.M.S., in "*Times*," *Feb. 1, 1881*.

"It is well known that plants and trees situated in the bottom of a valley suffer much more from cold and frost than those in a higher situation. This is due to the fact that the valley, if surrounded by hills and high grounds, not only retains its own cold of radiation, but also serves as a reservoir for the cold heavy air which pours down into it from the neighbouring heights. It is thus that the higher grounds in Switzerland are warmer than the valleys or gorges, as in these the cold collects as in so many basins. It is also found in this country that plants and shrubs which survive the severity of winter on ground raised above the

level of the valley perish when grown in the valley itself. The great advantage of a hilly position is thus apparent, and has been amply proved by Herr Hoffman's observations at Giessen. Here he found that the plants so situated took little or no harm from the intense cold ; while quite near, in the valley, there was extensive injury. The injury too decreased in proportion to elevation above the valley. As to the immediate effect of temperature upon plants, the author is of opinion that it is not a particular degree of cold that kills a plant, but the amount of quick thawing. This was illustrated in one case by the curious fact that one and the same bush—a species of box—was killed in its foliage on the south side, while on the north the foliage remained green. The sudden change of temperature produced by quick thawing was considered to be some degrees less for the plants in a high situation and for the shady sides of the half-killed shrubs. The higher situations are in this respect also favourable to plant-life, because, while the frost is not so severe as in the valley, the effect of thawing winds is found to be the same for both. The plants on the higher grounds are therefore subjected to less strain by sudden variations from a low to a high temperature, and the reverse, than their congeners in the valleys. These facts are of importance in determining questions as to the sites of country houses and gardens.”—*“Chambers' Journal,” Feb. 19, 1881.*

“Not only were the late frosts most destructive in low situations, they seem also to have had a much more injurious effect on vegetation within a few feet of the surface of the ground than they had as many yards above it. And of this I was struck with a remarkable instance in a wood in this neighbourhood, which consists chiefly of oak. For the space of several acres, I observed the opening foliage of the underwood oak, about 7 or 8 feet from the ground, to be entirely cut off by the frost, though the bushes were of course much sheltered by the overshadowing boughs of the poles and trees above them, while, contrary to what might be expected, the foliage of the poles and trees themselves which were exposed to the atmosphere, but

elevated some yards above the underwood, remained unaffected. In the case also of single oak-trees in other situations I observed the foliage of the lower boughs to be cut off by the frost, and the head of the higher branches to be unimpaired."—REV. MR. BREE, of Allesley, in a note to Brown's edition of White's "*Selborne*."

"The frost of December, 1879, was remarkable for its great severity and long duration, and Mr. Marriott has collected valuable statistics regarding its distribution in the British Isles. From these it appears that at Farley, 638 feet above sea-level, the absolute minimum recorded during the frost was 17° , while at Oak, a moor only 350 feet above sea-level, and only a mile distant, the great cold of 1° was reached. Similarly at Cheadle, 646 feet high, the minimum was $17^{\circ}.6$, while at Tean, 470 feet high, the minimum was 2° . These stations are situated respectively on the hill and in the valley. Places situated on hills or slopes, from 150 feet to 700 feet above a plain or valley, have a much smaller annual range, and also a smaller daily range, than places on the lower level. A higher station (545 feet higher) may on the coldest nights register minima 12 or 13 degrees higher than the lower, and on the hottest days maxima 7 degrees lower. At a height about equal to the upper rooms in a high house, a more equable and drier climate prevails than at lower levels, much less cold on cold nights and on foggy nights than down below; conditions on natural elevations are on the whole similar."—HON. F. R. RUSSELL.

The produce in the gardens at Aperfield Court, on the North Downs, in Kent (630 feet) used to be nearly always earlier than that at Squerries, Westerham (400 feet), the thermometer at Aperfield being as a rule $2\frac{1}{2}$ degrees higher than at Squerries.

At Denbies, Dorking (610 feet), when the thermometer registers 2 degrees above freezing, at Burford Lodge (140 feet) it indicates 5 degrees below freezing.

The minima of the temperature at the top of Bridge

Road, Redhill (377 feet), are found to be higher than those at a point in the valley, Linkfield Lane (275 feet), and the maxima of the hill are lower and the mean higher than in the valley.

To come down on a calm winter's day from the top of White Hill (700 feet above the sea-level) into the Caterham Valley, is like coming from a warm climate to a cold one; there is a sensation of raw coldness in the air in descending into the valley which is not experienced on the hill.

This is also the experience of a gentleman living on the hill above Kenley Station. He says that on coming down to the Station it is like coming into a different climate; he comes from clear sunshine on the hill into a cold fog down at the Station.

"When ascents are made during severe frost, it has been found that a temperature of say 60° Fahr. and pleasant weather have prevailed at the level of 5,000 feet, while at sea-level the temperature was more than 30 degrees lower. It is well known in the Alps that the hardest frosts are much less severe on the hill-tops than below, and in Styria there is even the saying,—

If in winter you mount up a story higher,
You find it a great-coat warmer.

"That the air in severe frosts is frequently warmer on the mountain-tops than below, arises in great measure from the fact that the cold air has a tendency to flow down the mountain-sides. This fact of low-lying bottoms being colder than uplands is well known to all gardeners, who find that the plants at the lowest part of their grounds are the first to suffer from frost."—*The Upper Air*, by R. H. SCOTT.

The Atmosphere in elevated Situations is more beneficial than that of lower Situations, not only because it is drier and warmer, but also because it is more rarefied.

“The air of a cellar is close, damp, musty, and vitiated; that of the housetop is clear, pure, and bracing. On the surface of the earth the atmosphere is cold, raw, and impure; on the mountains it is dry, rarefied, and health-giving. The purer the air is, the more life does it impart to the blood, the more perfectly is the brain nourished, and the more vigorously does the mind work and the body move. Hence the ‘study’ of the clergyman, the ‘office’ of the physician and the lawyer, the ‘library’ of the family, the ‘sitting-room’ of the household, and the ‘chamber’ of every sleeper should always be in the upper stories; not merely for the greater purity of the air, but for a reason seldom thought of, and yet of great sanitary value. The higher we ascend, the more rarefied is the air, the greater bulk is required to impart a given amount of nourishment to the system. This greater rarity excites the instinct of our nature to deeper, fuller breathing, without any effort on our part; and this kind of breathing, as the reflecting must know, is antagonistic of consumption, that fell scourge of civilised society, which destroys full one-sixth of the adult population. In the city of Mexico, situated 7,000 feet above the level of the sea, only three persons out of a hundred die annually of consumption; while in our larger cities, but a few feet above the level of the sea, eighteen out of every hundred perish from that disease.”—“*Quiver*,” *March* 10, 1862.

“A valuable condition of the air in elevated districts is its rarefaction, which necessitates greater activity of the respiratory organs. The respirations are necessarily more frequent and more profound, the air breathed is relatively richer in active oxygen than the air of the plains, a more complete aëration of the blood is secured, all the portions of the lungs are called into full play and activity, and the air-cells are more completely dilated.”—DR. YEO.

"Elevation is of great importance. Mountain air is not beneficial solely on account of its purity ; there is another factor in the atmospheric rarefaction, and the expansion of the lungs thereby caused may be of great value in chronic first-stage cases."—DR. THEODORE WILLIAMS *on Climate*.

"If, as suggested by Professor Beneke, rarefied air is a bad conductor of heat, we can readily understand why high degree of cold at a great elevation should exercise a much less injurious and depressing effect on the animal organism than the same degree of cold at the level of the sea."—DR. YEO.

"It is impossible to tread the glorious Downs without the happy accompaniment of renewed spirits and a delightful sense of free respiration."—DR. MOSELEY.

"A certain morbid sensitiveness to cold, or rather to taking cold, is often greatly lessened by a residence in the bracing, rarefied air of elevated localities."—DR. YEO.

Elevated Situations are also best, because they have a purer Atmosphere and a freer Circulation of Air.

Dr. Angus Smith, in his "Contributions to Chemical Climatology," shows that at the tops of hills the air contains more oxygen than at the bottom.

Dr. Koch, in his investigations in connection with the cholera bacillus in 1884, found that the hills were exempt from cholera when in the cities lying low at their feet the disease was raging in a violent form.

"Countries moderately elevated are always more healthy than those at the level of the sea ; their inhabitants enjoy an atmosphere more invigorating, and are perceptibly stronger, more active, energetic, and enterprising than lowlanders. An open elevated site is also more beneficial because there is a freer circulation of air."—DR. SCORESBY JACKSON.

"Dr. Tyndall showed that where there is quiescence in the air, the tendency of his sterilised infusions to produce organ-

isms was increased."—*Report of Sanitary Congress, "Times,"*
September 27, 1882.

"Stagnation is the bane of health, and whether it be in air or in water, stagnation allows time for mixture with injurious compounds."—DR. CARPENTER.

"Moderately elevated situations are the driest, and relatively the warmest, in most if not all localities, particularly in winter; it is an equally well-established fact that the free circulation of air upon elevated situations renders them relatively cooler in summer; on the other hand, the want of such free circulation in more sheltered places generally makes them close, hot, and oppressive."—DR. JAMES WILLIAMS.

"The pent-up valleys in some of the loveliest spots in England are never thoroughly flushed of their air-sewage, in fact, never thoroughly ventilated; the consequence being that they are often cold, damp, and filled with the air of vegetable decomposition, whilst the heights which wall them in are warm, dry, pure, bracing, and full of health. Frosts affect potatoes and fruit more frequently in the dewy calm air of a valley-bottom than they do on the heights above, where the air is constantly changed. In such valleys man contracts rheumatism, the basis of the national heart-disease, and what is of equal importance to know is, that in such valleys all diseases of the zymotic class linger the longest and assume the most aggravated form. The rheumatic and fever miasms hang about the still air of the valleys, and as it were grow in strength with the accumulation of air-sewage. The great majority of heart-disease cases have their origin in rheumatism, and both coincide in their prevalence in the deep unventilated valleys of Devon, Dorset, Hants, and Hereford. Those districts which are entirely hemmed in on all sides, and thus do not admit of thorough air-flushing at all, have invariably the very highest mortality from heart-disease, while those districts which admit air-flushing on all sides have the lowest mortality. Wherever the highest mortality from heart-disease is indicated, there is to be found the greatest amount of rheumatism, and to rheumatism

must be attributed the bulk of the fatal cases of heart-disease in this country; it will therefore be seen how necessary thorough air-flushing is."—DR. HAVILAND, "*Geography of Disease*."

"Hundreds of lives are sacrificed every winter to the evil influence of the theory, that shelter from the east wind is necessary in every case where delicacy of constitution or diseased structure exists. Shelter from the east wind!—as well seek shelter from the air we breathe; there is no such thing to be had. True, we may have a hill to the eastward of us, and live under its shadow, which shadow in the winter will be a very long one, and for hours of the best winter's day will deprive us of the health-giving direct rays of the morning sun, but even then the enemy is upon us. In truth, shelter from an easterly wind is altogether incompatible with taking exercise while it blows, in any English health-resort whatever."—"A *Health-resort*," by DR. ELLIS, *Eastbourne*.

The Dampness, Coldness, and Unhealthiness of Sheltered Situations and profusely Timbered Districts, and the Necessity of Light and Exposure to the Sun.

"Light is essential to life, like air. Light is thought, light is as fresh air to the mind. Pure air, free from suspended matter, lets the light pass freely, and perhaps this absence of suspended material is the reason that the heat is not oppressive. Certainly it is not so hot as London; on going up to Town on a July day, it seems much hotter there, so much so that one pants for air. Conversely, in winter London appears much colder; the thick, dark atmosphere seems to increase the bitterness of the easterly winds, and returning to Brighton is like entering a warmer because clearer air. It is the dryness of the place that gives it its character. Trees are not wanted in Brighton; it is the peculiar glory of Brighton to be treeless. Trees are the cause of damp, they suck down moisture, and fill a circle round them with humidity. Places full of trees are very trying in spring and autumn, even to robust people, much more so to convalescents

and delicate persons. Have nothing to do with trees if Brighton is to retain its value. Glowing light, dry, clear, and clean air, general dryness, these are the qualities that rendered Brighton a sanatorium; light and glow, without oppressive, moist heat, in winter a clear cold. Most terrible of all to bear is cold when the atmosphere is saturated with water. If any reply that trees have no leaves in winter, and so do not condense moisture, I at once deny the conclusion; they have no leaves, but they condense moisture nevertheless. This is effected by the minute twigs, thousands of twigs and little branches, on which the mists condense and distil in drops."—"Sunny Brighton," by RICHARD JEFFERIES.

"How many patients of limited means are ordered off to towns where they can only afford poor accommodation in dismal streets, innocent of the rays of the winter sun, but not of the gloom and damp of a short winter day. A more wealthy sufferer may secure a house in a fir-plantation, being unaware of the fact, till learned by experience, that while the aroma given off by the trees is *nil* during the winter, the direct rays of the sun are excluded by them, and that during damp weather, even when it does not rain, they steadily drip from condensation of the moisture of the air."—DR. ELLIS.

"Foliage does not add to the salubrity of any place, and in excess is positively injurious. Many of the country seats of the gentry, so delightfully surrounded and embosomed in woods, are from that very cause unhealthy. Independent of the interruption of the free circulation of air which is so essential, a large quantity of vegetable matter in a state of decomposition is sometimes productive of disease, more especially in spring and autumn."—DR. WIGAN on *Brighton and its Climates*.

"The Elizabethan Evelyns chose for their home a very different site from the one that would be chosen, under like circumstances, by the founder of a modern family. Nowadays we should prefer an open and airy position on the hill-top, or, at least, high up the flanks of the down, with a wide view from the

drawing-room windows over the exquisite undulating summits of the Surrey hills. In the sixteenth and seventeenth centuries the monastic ideal of a low site in a rich valley still dominated the minds of the English squirearchy. So the Evelyns planted their brand-new mansion in the very hollow of the tiny dale, and simply threw away for ever the exquisite view they might otherwise have obtained from every window of the big house. What was their loss is our gain; for though to its inmates Wotton House must be thereby the less beautiful and habitable, to those who look down upon it from the hill-side above it forms at present a most charming element in a delicious landscape. The fact is, no house can at once both see the picture and be the picture. We nowadays, for the most part, elect for seeing it; the Elizabethan builders preferred rather to make their house a bit of it,—the central factor in the total prospect. Wotton House looks out only upon a courtyard on one side, and upon a garden on the other. It has wholly sacrificed its possible view, but in doing so it has made itself a lovely object in everybody else's view from the adjoining brows. A certain suggestive air of snugness and comfort, indeed, clings always to these old-fashioned mansions, nestling close, with smoke-wreathed chimneys, in their combe-like hollows. Professor Tyndall has long since taught us, to be sure, that on grounds of health we ought sedulously to avoid such snug quarters, where the germs of microscopic or morbid organisms literally swarm in the stagnant air. But as a mere picture, and for somebody else to live in, nothing could be more charming than situations such as that of Ford Abbey or of Wotton House, planted daintily in the exact middle of a sweet small valley. It was very foolish, no doubt, to stick a house in such an extremely low and damp position, but how very thankful we ought all to be (who do not live in it) for that picturesque foolishness of mediæval monks and Tudor architects."—"Wotton House," *"Magazine of Art,"* March 1887.

"Dryness, a free circulation of air, a full exposure to the sun, are the material conditions to be attended to in choosing

a site for a residence. Of all the physical qualities of the air humidity is the most injurious to human life, and therefore in selecting a situation for building, particular regard should be had to the circumstances which are calculated to obviate humidity in the soil and atmosphere."—SIR JAMES CLARK *on Climate*.

"Amongst the conditions most favourable for a genial climate depending on solar intensity are,—great elevation above sea-level; a clear sun with white clouds; a clean atmosphere,—no dust or smoke or fog; a minimum of watery vapour in the air."—*Climate, "Nature,"* 1882.

"The advantage of a residence on the hills is, while the air is brisk and pure, the sun is bright and warm, warmer than in the valleys. This arises from the fact that while the inferior layers of the atmosphere are rendered more or less opaque by humidity and dust, which absorb the sunbeams, the drier and purer regions of the upper air offer no impediment to the passage of the brilliant solar radiation. The air of the hills is less moist and heavy than the air of the plains and valleys, much of the trouble of filtering it is spared the lungs. As the climber ascends, he carries a diminished weight, the spirits rise with the lightened atmospheric load, the mind is gladdened by the unclouded radiance of the landscape. It is a modern discovery that heights are not so unbearably cold as valleys; though the breeze career over them at will, there are no draughts, weak chests are not assailed by a dozen different temperatures within half a dozen hours. Not a few hill-tops are to be found, even at home, where Englishmen may luxuriate in air pure and light and bright, and enough ozone runs daily to waste on the Surrey hills to brace all London for the working year."—"Times," September 18, 1884.

"A slight agitation of the atmosphere occasions such a feeling of well-being that the chest dilates in consequence, and admits a larger proportion of air. The degree in which the air is agitated exerts the most decided influence on the extent to which the chest dilates; the agreeable sensation which is expe-

rienced on breathing in the country is chiefly owing to this cause. I have often observed in consumptive patients the beneficial effects of an air moderately agitated, as well as the disadvantage of too calm an atmosphere. The insensible perspiration of people living in a calm air saturated with humidity, as in damp valleys, is reduced to its minimum ; on the other hand, the skin is powerfully excited by the air of mountains, of elevated plains, and of the sea. The ventilation there carries off a considerable quantity of the elements of insensible perspiration.”—DR. LEE on *Climate*.

“ We say we go into the country to enjoy fresh air ; in what does the freshness consist ? The answer is,—The air in the country is generally cooler than that of towns ; it is also in more rapid motion. These two circumstances make it more stimulating to the skin and lungs. The impact of cool air upon the skin of the face and neck is highly stimulating to the system. The excitement of the nerves of the face assists the action of the muscles of the chest in respiration, which becomes deeper and fuller under its influence. Hence more oxygen is drawn into the system, and the vigour which this gives to the nutritive functions reacts upon the frame and nervous system in producing a feeling of exhilaration and renewed strength. This feeling is more especially called forth when we ascend hills. To persons of tolerable health every step of ascent removes a portion of the incubus of inertia.”—DR. STRANGE.

“ Where are produced the germs which give rise to such diseases as diphtheria, certain forms of congestion of the lungs, tubercular diseases, and many others ? Professor Klebs has an answer for us ; he says, ‘ All the diseases referred to possess one remarkable property in common, and arise from influences which are conveyed to the human body more or less directly from the soil.’ From the history of their origin one may indeed designate them soil diseases. The consideration of these soil diseases makes it clear that in winter as in summer, whether ourselves in health or suffering from some abnormal condition, we should live in a free, clear air and bright sun-

light, and that in fleeing from the terror of an east wind, which may not come, we almost certainly place ourselves in no little danger of disease from other and far more potent causes. Where indeed does consumption most assert its power? and where are disease and debility? On the sea-shore? on the breezy downs? or in the nook sheltered from the east, guarded from the north, protected from the west, and possibly only partially open to the south? Such a situation may be pleasant, but it is unhealthy, and why? Because the germs of disease are there, germs derived from some of the various forms of decomposition always going on around us, but the baneful effects of which are speedily removed far from us under other circumstances. If these germs retained in sheltered situations exercise a deleterious effect on the strong and healthy, how much more may we expect the weak and ailing to be injuriously affected!"—"*A Winter Resort*," by DR. ELLIS.

"Apart from hereditary causes and poverty, there are two great antecedents of phthisis; one so positively insisted on by Dr. Macnamara, of Belfast,—bad air; the other by Drs. Buchanan and Bowditch,—dampness of dwellings or subsoil. Dr. Weber has added yet another, namely, septicity of the air in different localities on the sea-level. Consumption is much rarer in localities situated far above the sea-level. Dr. Lombard, of Geneva, alleges that high and medium altitudes have a prophylactic and therapeutic influence in phthisis, and mentions that phthisis in Switzerland was unknown among the dwellers in spots 4,500 to 5,000 feet above the sea-level. Dr. Denison, and recently Dr. Williams, have insisted on the advantages which the consumptive reap from the increased respirations and increased volume of air respired by them where the air is rarefied. The lungs, says the former, have no rest; and in this lies their salvation, since by this means the disease-germs are being constantly expelled from the body, and the diameter of the chest is increased. Dr. Wilson Fox remarked that high altitudes are freer from damp, ventilation is better, and the air is purer, all of which points are favourable to the cure or arrest

of the disease, and the climate may be cold as at Davos, or warm as at Blomfontein in South Africa."—DR. DRYSDALE, "*Brit. Med. Journal*."

"The residents on these hills enjoy the very great pleasure of good health, doubtless due, in the first place, to the quality of the air purified by the height, and the distance it has come over open country; it is not less exhilarating than the breeze from the sea, and has the advantage of being drier."—" *On some County Downs*," "*Times*," September 21, 1881.

"Delicate persons should not sleep on a ground-floor or live in low, confined situations, and living near the top of a high house or on the ridge of a hill would be of great benefit in many cases of lung and throat diseases, and in cases where night air has a bad effect."—HON. F. R. RUSSELL.

"Altitude and soil-dampness have undoubtedly great influence, the first in preventing, the second in developing phthisis, and in both the facts indicate that there is a something in large measure independent alike of the constitution and social habits of the population subject to it, but without which phthisis cannot exist. It is certainly improbable that altitude acts by producing sooner or later a race of men which is proof or all but proof against certain morbid conditions. For on the one hand natives of the hills readily contract phthisis in the lowlands; and on the other hand the lowlanders recover when moved to the hills."—DR. ANDREWS, "*Brit. Med. Journal*," April 5, 1884.

"*Wellington College and Rugby Speech-days*.—While at Rugby the head master could congratulate the boys on their achievements, both at the Universities and in the cricket-field, the head master of Wellington made apology for the paucity of honours gained by the boys at his school. These two schools draw their students from the same spheres, the scholarship of the staff of masters is very much on a par. Boys destined for the army, as those at Wellington are, should not be inferior to those intended for civil callings in life, either in intellectual culture or prowess

in games; yet, on the showing of the two head masters, there appears to be a wide difference. Wellington boys are behind Rugby boys in competition at the Universities. Has the difference in locality anything to do with this? Rugby is situated on a high table-land, where the wind blows with an invigorating force, and braces to the fullest energy, while Wellington College is on a low-lying plain, with adjacent hills which drain into the marshes below, rendering the air damp and enervating. In this country, and probably elsewhere, those who dwell on higher lands are less liable to disease than the dwellers on plains, especially marshy plains, and anything that predisposes to disease, enervates the system, and lessens the capacity for mental and physical energy. It would be interesting to learn the proportion of deaths at all our public schools among all the pupils actually there and within ten years of leaving, to enable the primary cause of death in early manhood to be traced back, and we have good reason to believe this could often be referred to school-life, little as parents suspect it."—*"Lancet," June 27, 1885.*

"Both phthisis and malarial fevers decrease in severity and finally disappear with increasing elevation above the sea-level. Both are closely connected with wetness of soil."—DR. ANDREWS.

"Of all the resources at our command against the malady of consumption, threatened or established, dependance can only be placed on climate. The popular belief that phthisis is common in cold climates is fallacious, and the idea now so prevalent that phthisis is rare in warm climates is as untrue as it is dangerous. The disease causes a large proportion of deaths on the sea-shore, the mortality diminishing with elevation up to a certain point. Altitude is inimical to the development of consumption, owing chiefly to the greater purity of the atmosphere in elevated situations, its freedom from organic matter, and its richness in ozone. Moisture arising from a clay soil, or due to evaporation, is one of the most influential factors in its production. Dampness of the atmosphere, from whatever cause or at any altitude, predisposes to the develop-

ment of the disease, and is hurtful to those already attacked. Dryness is a quality of the atmosphere of decided value. The most unfavourable climate possible for a consumptive is a warm and moist one. A dry, bracing atmosphere, which will enable patients to live much out of doors without taking cold, is to be recommended."—DR. JONES, in "*New York Medical Journal*."

"It is a well-ascertained matter of fact that consumption especially becomes rare in lofty situations; moreover the general good effects of an elevated site of residence, feelings of lightness, cheerfulness, improved digestion, &c., are most likely to be experienced by those who have previously been located in some warm, sheltered nook of the coast."—DR. SPENCER THOMPSON on *Health Resorts*.

"The conclusions that result from the geological and statistical examination of Kent, Surrey, and Sussex are as follows:—

1. That on pervious soils there is less consumption than on impervious soils.
2. That on high-lying pervious soils there is less consumption than on low-lying pervious soils.
3. That on sloping impervious soils there is less consumption than on flat impervious soils."—W. WHITAKER, F.G.S., on *Geology and Consumption*.

"The mortality from cancer is highest in those districts which skirt the banks of the rivers. The Thames runs through a vast cancer-field. In fact, throughout England and Wales there does not exist an important river that does not flow through high-mortality districts; on the other hand, all those districts where cancer does not thrive are characterised by being high and dry, and geologically composed of non-retentive soils, permeable soils in fact. With such knowledge it would follow that whenever there is a tendency to cancer the sufferer should be removed to high, dry sites; and perchance if whole families were thus to migrate, we should not have so much of the hereditary character of cancer, or of many other diseases."—DR. HAVILAND.

"The hills have become mediciners. Certain localities, indeed, have come markedly to the front in respect of their health-giving and health-restoring qualities. The environments of the hills are replacing the druggist's shop in the treatment of disease. Nature is being substituted for Art in this respect. The value of fresh air and exercise, as good for mankind, is a sentiment as old as humanity itself. Primarily it is the exquisite purity of the air at great heights which gives them their beneficial virtues. Tyndall found that infusions of matter which in the city atmosphere would have fermented and gone to the bad in an hour or two, preserved their sweetness when allowed to come in contact only with the pure air of the hills. There is no telling how many germs, or how many different kinds of these living particles, we inhale into our lungs and stomachs with every breath we draw while we reside in cities and towns. High up on the hills we revel in a germless atmosphere. Physicians skilled in the treatment of lung troubles have united in praise of the hills. Formerly man hastened to the hills for refuge; to-day he recognises in the hills his best friends in sickness."—"Daily News" Leader.

It may have some interest here to quote the statement of the superintendent of the last U.S. census in the "Century" of October, 1882 :—

"Of the population of the United States in 1880, 9,152,296 lived less than 100 feet above sea-level; 10,776,284 at altitudes from 100 to 500 feet; a number almost equal to both the previous classes, viz., 19,024,320, from 500 to 1,000 feet; 7,904,780 between 1,000 and 1,500 feet; 1,878,715 between 1,500 and 2,000 feet, leaving 1,500,000 on all the higher altitudes; of the latter nearly 100,000 live more than 7,000 feet above the sea."

Given an elevated, open position, with all the demonstrated advantages, what subsoil is most certainly calculated to *secure, assist, and increase those advantages?*

Abundant evidence has now been given establishing the great advantages possessed by elevated open situations over such as are low, close, sheltered ; but confining ourselves to the Home Counties, we know that the elevations within that range vary considerably in their geological composition, some being Clay, others Sand, Gravel, or Chalk. It may be asked, Has the composition of an elevation no influence upon its climate ? It has almost as vital a bearing as elevation, when elevation is secured, if only because of the following consideration, namely,—

The Climate of a dry Soil is warmer than that of a damp one.

The late Dr. Parr informed the author that the temperature at his house on the sand at Betchworth was, as a rule, from four to five degrees higher than at the Vicarage, Brockham, on the clay ; also that the temperature on the clay at Wray Park was about four degrees lower than at Reigate Park, on the sand.

“Most people have some indefinite notion that a clayey soil is not conducive to health. The reason is obvious ; rain cannot penetrate the clay, surface-water accumulates, and by evaporation reduces the temperature of the air, imparting to it what is called a raw cold feeling. On the other hand, many people are strongly persuaded of the superior excellence of a gravelly soil, and it commands a high price for building purposes. The reason is equally clear ; the loose nature of the soil permits the free percolation of the falling rain, and leaves little or none for evaporation from the surface, consequently the coldness and fogginess are reduced to a minimum.”—DR. PARSONS *on Dover as a Health Resort*.

Gravel is not necessarily always a dry soil ; where it is scarcely above the water-level of the district, or rests on

a retentive clay in such a manner as to hold up the water in it, it is a damp soil, and generates a humid climate. Considerable areas of gravel in the neighbourhood of London are so circumstanced, and where cellars are impossible, houses ought not to be placed.

CLAY.

Clay is notoriously out of court here, as whether it is the London Clay, which occupies so large an area round London, even of the surface, and underlies that vast area of the Tertiary Sands on which Bagshot stands, extending through so much of Surrey, Berks, and Hants, or whether it is the deep, tenacious Gault, which divides the Greensands in the Vale of Holmesdale, or the deep, tenacious Clays of the Wealden formation, it is always and at all altitudes a dense, tenacious, damp, cold sub-soil, neutralising most of the benefits of elevation.

SAND.

The Lower Greensands are not always and everywhere dry soils ; the uppermost or Folkestone beds are often low-lying and boggy, and the lower series are not all porous, they comprise also more or less impermeable beds, and the whole formation rests on the deep beds of the Weald Clays, which have by no means a uniform thickness ; they may here and there rise almost abruptly, in some cases, as in West Surrey, actually protruding through the overlying Greensands, and may form local basins of comparatively small area, within which the water is imprisoned in the porous beds of the Lower Greensands.

A sandy soil is not always healthy. In the lower and more sheltered parts of the lovely Vale of Holmesdale,

extending beyond Westerham in Kent eastward to the Hogsback beyond Godalming on the west, the climate is moist and relaxing. Only the more elevated and open parts on the Greensands are healthy.

"There has been for a long time past a growing impression that no soil is more susceptible of insanitary impregnation, where insanitary conditions exist, than the porous Bagshot sands, a name given to the extensive tract of moorland and heath extending many miles around the village of Bagshot, which is in its centre. The low-lying portions of this tract of country are very marshy, and those localities midway between hill and dale are apt to be very damp also. Intermediate layers of clay often extend for long distances a few feet below the upper porous sand, converting what on the surface appears to be a dry soil into a damp one."—*"Lancet," Aug. 29, 1885.*

"The deaths from puerperal and other fevers in the registration district comprising Bagshot Park are double those in the Windsor district, and in excess even of those from similar causes in most of the poorer districts in London. There must therefore be something beyond defective house-drains to give rise to this high death-rate in a country district in the midst of moor and heather, and in the very centre of the wide range of sandy soil known as the Bagshot Sands. The low-lying damp districts of this range are insanitary, and specially favourable to septic diseases, diphtheria, malaria, and what is popularly known among the poorer inhabitants as aguish rheumatism, and residents in these low-lying districts are liable to one and all of them."—*"Lancet," July 13, 1886.*

"One of the highest authorities on this subject writes that telluric poison or malaria prevails in sandy plains containing organic matter, if there is a subsoil of clay or marl."—J. G. BARFORD, *"Lancet," July 19, 1884.*

In the district between Woking Station and the village of Chobham, with a gravelly and sandy surface, the compiler remembers noticing the deep ditches filled with

stagnant water even in the summer time, betraying the universally underlying clay.

In the "Lancet" for January, 1884, many cases of illness, chiefly sore-throat and diphtheritic sore-throat at Wellington College are alluded to as being caused by the mists and fogs arising from the presence of the sub-soil of clay under the thin layer of sand, and at another public school, Charterhouse, Godalming, many cases of the same kind have arisen; although the situation is altogether different from that of Wellington College, which is on the Tertiary Sands of the Bagshot series overlying the London Clay, while Charterhouse School is on an elevated portion of the Hythe beds of the Lower Greensands. This hill, however, appears to be a narrow spur bounded on the south by the Valley of the Wey, and on the north-east by the Atherfield Clay and a portion of the Weald Clay; some of the outlying houses belonging to the schools may be on these low-lying damp parts, and the moist, chilly atmosphere surrounding the hill on which the school is situated may permeate and very unfavourably modify the climate even of the hill. At Christ's Hospital, Hertford, epidemics have occurred from time to time. In "The Citizen" of October 9th, 1886, "Medicus," writing about a recent epidemic of sore-throat there, asks whether Hertford itself,—a town lying low, and at the confluence of five rivers and other streams,—is an altogether eligible locality for such a school. Very energetic measures have been adopted, we believe, at these schools to remove the cause of the ill-health, but no measures that can be adopted can make a naturally insanitary site, or even a site healthy in itself but in too close contiguity to insanitary conditions, equal to sites high, dry, and healthy, and with no low, damp, marshy or otherwise insanitary districts anywhere near them.

The insanitary state of the village of Limpsfield has been for several years a constant trouble to the Sanitary Authority of the Union, and the Gault Clay and low-lying beds, more especially of the Folkestone series of the Lower Greensand in the parishes of Oxted and Limpsfield, together with the very large areas of woodland in that part of the Vale of Holmesdale, cause a dampness of climate. The higher and more open portions of Oxted and Limpsfield, on the Sandgate and Hythe beds, are more healthy.

GRAVEL.

Gravel may be a delusion and a snare: have faith in it, only, when it is above the high-water-level of the district, and only then, when you know that its inferior geological conditions are favourable to its dryness; for gravel is generally either a low-lying river-gravel, as in the Valleys of the Thames and the Wandle, where it is too generally worse than even clay soil in its superabundant wetness, or when in a more elevated position it may, and often does rest on impermeable beds, which may be so tilted, or scooped out, as to hold water like a basin, and the gravel resting on them, even when in an elevated position, if not so elevated as to rise considerably above the edges of the impermeable basin, may be a reservoir of chilling stagnant water.

CHALK.

The Dryness of a Chalk Subsoil when well elevated, and its Advantages, especially in proportion to its Elevation.

Where Chalk rises to a considerable height above sea-level, you may always rely on its being a dry, self-draining formation, for, unlike gravel, which is a super-

ficial and local deposit, chalk is an enormous continuous mass several hundreds of feet thick, and at Woldingham even the deep sheltered valleys are 500 feet above sea-level, and possess a dry climate; the friable soil rests on a finely comminuted Chalk to the depth of forty feet, and that on the porous Chalk rock. These valleys are therefore most thoroughly self-drained; the heavier rains pass immediately through the soil, and through the finely-divided mass of Chalk, into the depths.

“A chalk subsoil is remarkably porous,—so much so, indeed, that no artificial drainage is required, neither are there any ditches or watercourses. The whole of the pluvial waters pass off by infiltration. The great porosity of the subsoil, and the quickness with which the moisture dries up after rain, give great dryness to the atmosphere.”—DR. KEBBELL.

“The soil over all the South Downs is a chalk rock covered with earth of various kinds and depths in different places. The advantages resulting from this kind of soil are many and considerable. Chalk ground has little or no perspiration, and therefore must be extremely healthy. The fertility of it as to grain is indisputable, and is owing to the native bed of chalk, dug up by the farmers in the very field they restore it to the surface of again, for its own and their enrichment. The abundant crop which it produces, aided by this manure, are not so surprising as the ability of its continuing to do so for upwards of twenty years, from a single act of manuring. The grass of this soil is of the finest texture and of the sweetest taste, and, in this particular place, is interspersed with wild aromatic plants of different sorts, which might easily be increased to the advantage of the proprietors and the public. The ground of this soil does not crack, nor the grass burn so soon as in other soils. This is perhaps partly owing to the reflecting power of the chalk, partly to the declivity of the hills; and yet in wet weather it sooner grows dry, so that you may immediately ride after heavy rains, without the least inconveniency. Hence it follows that in this soil there can be no marshy, swampy

ground, except in such places as border on rivers. Now as the nearest river to this town is really distant six miles, I may venture to affirm that the soil here is extremely dry, and that the air of this place must be proportionably pure."—DR. RELHAN on *Brighthelmstone*.

"The chalk downs furnish the purest and most exhilarating air in the world. Never on the Alps, the Apennines, or the Jura have I felt so intensely, so exultingly, the abstract pleasure of mere animal existence as on the Downs in the neighbourhood of Brighton. No decomposition on the surface, because no humidity will remain there; at such a distance, or such an elevation, above the sea, that all which is insalubrious in the air has been deposited before it reaches there. A canter over the Downs on a fine day produces the feelings of the Arab in the Desert; the breathing deep and complete, and every air-cell of the lungs fully opened and performing its duty. Eat and drink whatever you please, and as much as you please, if you can take abundant exercise on the Downs."—DR. WIGAN.

"I think it must be admitted by even the greatest admirers of the sea-side, that inland situations, all things considered, have certainly the advantages over those on the coast in March, April, and May. I do not mean *all* inland places indiscriminately, but dry, open, elevated, or undulating spots, with a gravelly or chalky porous soil, and with no marsh land or other well-known source of disease sufficiently near to affect the salubrity of the atmosphere. There can be no question that the air of such places during the day is warmer, softer, and more pleasant to the feelings."—DR. KEBBELL.

"That happy district, which has that glorious Chalk subsoil, which almost enables it to defy the damp and fogs of the season when autumn is fast sinking into winter."—"Sussex Express," Nov. 16, 1875.

"In almost all situations on the Chalk the soil is naturally well drained, which gives it advantages."—B. DYER, F.C.S.

“On the Chalk, ground exhalations are unknown. The natural drainage of the land is perfect, for the porous, thirsty character of the chalk sucks all superfluous surface-moisture down to the depths.”—A. MAHEW.

“The remarkable salubrity of the northern coast of Thanet is attributable to two causes,—the absorbent quality of the chalk soil, and the dry, highly oxygenated state of the atmosphere.”—A. MAYHEW.

A thin layer of clay resting on Chalk in an elevated position is a very different thing from clay resting on deep beds of clay; for through the untold numbers of ages during which the Chalk has been acting by thorough drainage on the superincumbent clay, it has become more or less porous; and sheer impermeable clay will never be found in such a position, it is always more or less of a sandy loam, mixed and broken up and made more porous by being mixed with the flint relics of an earlier Chalk which has passed away; and this loamy drift is an advantage and not a drawback, as it forms one of the most productive soils for gardens and ornamental grounds and shrubberies.

“The condition of the dry atmosphere of the north coast of Thanet,—an elevated Chalk district, charged as it is with an unusual amount of oxygen,—is in no way favourable to the promotion of corpulence. For people with a tendency to make fat, or with sluggish systems which require bracing, or those suffering from liver disease, this air, in my opinion, is unequalled along the whole of our coast-line. Owing to the peculiar character of its constitution, I calculate that a person will consume during a period of twenty-four hours twice as much air at Birchington-on-Sea as he will in the same given time in London. But the superabundant oxygen which one breathes in Thanet is a greater agent in promoting waste, it must be remembered, than it is in stimulating our functions. Under the influence of this air we eat much, but our digestion is more rapid than in

Town. Our system is continually at work, and that so actively, too, that the mere acceleration of our machinery is almost of itself sufficient exercise to our body to preserve us in health. On this account, for all sluggish systems, and particularly for the bilious and the obese, I consider the northern coast of Thanet unrivalled."—SIR ERASMUS WILSON.

"I must say, in homage to truth, that whether owing to the dryness of the soil, or to whatever more occult sanitary influence, the very fiercest gale at Birchington has never yet in any way injuriously affected me. In London, a wetting, or a walk through the mud, would always be safe to land me in rheumatic rackings, or in gouty fits. At Birchington neither the very heaviest walk, nor the most thorough soaking, ever seems to have the power to hurt me, or, for the matter of that, any of the many invalids coming in search of health to this truly glorious sanatorium. When I was within the very gates of death, a dear medical friend of mine, a distinguished West-end practitioner, saved me by advising my instant removal to my old Birchington quarters. I had a hard and protracted struggle for it indeed; but the beneficent, health-giving, tone-restoring *genius loci* of this blessed little place pulled me safely through, leaving me to live the brief remainder of my days with comparative soundness of body. I may honestly and sincerely advise all invalids suffering from asthma, affections of the lungs, skin diseases, gout, rheumatism, dyspepsia, and the manifold disturbances of the liver functions, to give Birchington a fair trial."—"Tinsley's Mag."

Birchington occupies an elevated position on the Chalk.

"No soil is drier than chalk when it has a fair elevation. In many districts the bulk of the population who live on chalk occupy valleys with the water-line in the chalk not many feet below their houses. In the south of Sussex a still greater degree of wetness is reached, a large part of the area reckoned as chalk is a flat plain on the sea-level, and the position as regards consumption of these districts will on the whole repre-

sent the order in which they would stand if they were arranged according to the better or worse elevation of the chalk area in which the population live. Thus, North Aylesford, Thanet, and Dover, which stand 7th, 8th, and 9th among the 58 districts, have their inhabited chalk areas far more elevated than Worthing, Lewes, and Westbourne, which are respectively 48th, 50th, and 57th on the list; and if the intermediate chalk districts be compared, then it is still found that they range themselves in much the same order in regard to consumption, and in regard of the high or low situation in which their population live, and the general connection between small consumption and elevation of the chalk area is not to be mistaken."—" *Tenth Report of Medical Officer of Privy Council.*"

"Where there is a tendency to cancer, let the patient be removed to the high dry sites. Cancer does not thrive on a high dry soil; the essentially chalk county of Hampshire is remarkably free from cancer, and we find throughout the whole of England the districts situated on the chalk hills are the healthy or low-mortality districts."—DR. HAVILAND.

"Experience teaches us that elevated places on sandy or chalk soil are most beneficial auxiliary agents for the diminution and prevention of consumption."—DR. EDWARD SMITH *on Consumption.*

"There are certain important points which ought always to receive due consideration in selecting a site for a new house; in the first place, the soil should be dry. The healthiest soils are gravel and chalk."—DR. G. WILSON.

"The soil should be considered, as heavy rains in gravelly and chalky districts are not so objectionable as on clayey ground."—DR. TRIPE *on Winter Climate.*

"In chalky districts the air is cool and dry, and the bracing, exhilarating nature of its effects upon the body corresponds with the pleasing sensations that are excited in the mind by the transparent sky and the cheerful smiling richness of the landscape so usually observed in such districts."—DR. FRANCIS *on Change of Climate.*

"The charms of sculpture and painting are beautifully blended in the graceful undulations and sweet fresh colouring of a chalk landscape like this."—*Anon.*

"The observations of Dr. Henry show that a chalky soil is far less irritating to the respiratory organs, owing to its solubility in the secretions, than a sandy soil which is insoluble."—*"Nice and its Climate," by DR. WEST.*

"The chalk districts have fewer cases of calculus than the gravel or sandy districts."—"Lancet," Sept. 4, 1886.

"If we were asked what was the single quality in a soil, the predominance of which would entitle it to be called good, we should say dryness; and as chalky soil is almost always dry, it is favourable for building on."—LOUDON'S "*Suburban Gardener.*"

There is something in the chemical composition of chalk which we believe not only deodorises the rainfall-water as it passes down to the deeper beds, but also acts as a purifier of the atmosphere, as scarcely anywhere so much as on a chalk soil, especially when at a considerable elevation, is there found such a feeling of freedom and buoyancy of spirit, such generally pleasant sensations, such an immediate improvement of the appetite, and such distinct immediate sensation of benefit to the general health.

The Advantages of a Chalk Subsoil for the Formation of Ornamental Grounds, Gardening, Grazing, and Farming Purposes.

"The farms that even now pay best are the light lands of moderate fertility, lands that are easy and cheap to work, and that will carry sheep. The Chalk lands are excellent; on them almost all crops can be grown, the working is light, and sheep can be kept well."—PROF. WRIGHTON.

"Give me," writes a correspondent, "chalk soil, dry, not burning, free-working, fairly fertile, high-lying, not so rich as grateful, sound, safe-cropping, healthy chalk."—"Agricultural Gazette," September 19, 1881.

"Where the chalk is mixed with clay driftings, we often get most excellent light soils; good for sheep, good for turnips, and good for barley."—"Mark Lane Express," Dec. 6, 1886.

"A chalk subsoil is generally covered by a depth of loam on the surface, which loam forms one of the very best soils for growing every description of vegetables in the highest degree of perfection."—LOUDON'S "*Suburban Gardener*."

"Boulder clay with patches of sand, gravel, and London Clay all lie above the Chalk in this district (*i.e.*, Sawbridgeworth, Herts). The chalk exists in the Boulder clay, and in fact permeates the entire system of gravel, sand, and Boulder clay, and gives strength and fertility to the trees and flavour to the fruits and vegetables."—FRANCIS RIVERS, ESQ., *author of "Miniature Fruit Garden," in letter to compiler.*

The Water of the Chalk Formation.

"Of all water-bearing strata, the Chalk is perhaps held most in favour for the sinking of deep shafts and bore-holes. This is no doubt due both to the abundant supply of water which it is capable of furnishing, and to the facility with which the operations of boring and sinking in it can be accomplished."—Page 99.

"Chalk is an excellent filtering and cleansing material for water, and whilst it absorbs a larger proportion of the rainfall than does any other stratum, the water is again yielded to deep wells in a condition of freedom from organic matters not surpassed by the water from any other geological formation."—Page 101.

"The deep well-waters from the Chalk rank amongst the best and most wholesome with which we have become acquainted.

They are almost invariably colourless, palatable, and brilliantly clear."—Page 102.

"The Chalk constitutes magnificent underground reservoirs, in which vast volumes of water are not only rendered and kept pure, but stored and preserved at a uniform temperature of about 10° C. (50° F.), so as to be cool and refreshing in summer, and far removed from the freezing-point in winter. It would probably be impossible to devise, even regardless of expense, any artificial arrangement for the storage of water that could secure more favourable conditions than those naturally and gratuitously afforded by the Chalk, and there is reason to believe the more this stratum is drawn upon for its abundant and excellent water, the better will its qualities as a storage medium become." —"*Sixth Report of the Commissioners appointed in 1868, on the Domestic Water Supply of Great Britain.*"

Professor Johnson, in his "Chemistry of Common Life," observes:—

"The bright, sparkling, hard waters which gush out in springs from our chalk and other limestone rocks are relished to drink, not merely because they are grateful to the eye, but because there is something exhilarating in the excess of carbonic acid they contain and give off, as they pass through the warm mouth and throat, and because the lime they hold in solution removes acid matters from the stomach, and thus acts gratefully upon the system."

Captain Aylesbury, of Sutton, situate on the Chalk, states as to the spring-water from the Chalk:—

"I drink the water as it comes from the spring without adulteration, and have done so for seven years. I have lost my rheumatic gout and rheumatism; and if I were to tamper with this beautiful water, which makes Sutton so healthy, I should expect to increase my doctor's bill very soon."

We have shown that an elevated site is more desirable and suitable for residential purposes than a low-lying one because it has a drier, warmer, purer, more rarified, and more active atmosphere, and that an elevated site on a chalk subsoil is the most desirable of all sites, because it is always beyond all doubt a dry one, as the necessary consequence of its geological conditions, and that neither sand nor gravel, even at a considerable elevation, can in every case be depended upon for dryness, because their underlying geological conditions may be such as to neutralise the advantages of elevation. Having treated of elevated chalk districts in general, we now invite attention to one particular district of elevated chalk country in illustration of what has been advanced,—a district very much nearer to London than the coast of Thanet, considerably nearer than Brighton, and actually within the precincts of the metropolitan area.

Very few Londoners know that there is so near to them a land of pure air and sunshine, where health may be restored and life brightened as surely as at any of those famous health-resorts, far away in our own Island or abroad, to which so many reluctantly exile themselves who would gladly remain near home and friends, if they only knew that in Greater London, almost at their own doors, in the high-lying Chalk district now opened up to London by the new main line from the London termini of the London, Brighton, and South Coast and the South Eastern Railway Companies, through their stations at Upper Warlingham and Marden Park, they would find the very climate they need, in the midst of as exquisitely lovely scenery as they could find abroad. Even already the district is beginning to be known, and con-

sequently sought after, and new country residences are rising here and there, and beautiful residential properties are in process of formation. Wide areas of many acres each of surpassing healthiness lie in the brilliant sunshine and pure clear air, eminently suitable beyond all question for the location of our leading public schools, as Christ's Hospital on its migration from Newgate Street, or from the insanitary site at Hertford, or for other public schools suffering from constant unhealthiness arising from low, damp, enervating location.

The elevated chalk district of Caterham, Chelsham, Farleigh, Tatsfield, Warlingham, and Woldingham, forming the northern parishes of the Godstone Union, raise that Union to the sixth place in the Tenth Report of the medical officer quoted before, notwithstanding the large areas of low-lying Weald and Gault Clays and low-lying Sands in the southern parishes of the Union.

An inhabitant of Oxted once told the compiler that mists and fogs are prevalent at Oxted, and that it is very different at Woldingham, which, he said, was much healthier than Oxted, the Woldingham air being, he also remarked, purer, lighter, and more strengthening. The dry, self-draining Chalk district of Woldingham, which is at its greatest elevation at its nearest approach to the Oxted Valley, lifts itself up like a wall of defence against malaria, rising hundreds of feet above the mists and fogs of the valley into the pure, bright, bracing restorative upper air.

An old inhabitant of Woldingham, on the Chalk hills of Surrey, 700 feet above the sea-level, on occasional visits to a farm on the low-lying Weald Clay in the southern part of Bletchingley parish, felt the air to be raw and chilly, and quite different from the air he was accustomed to, and he experienced similar unpleasant

sensations on a visit to a farm in the Weald in the west of Surrey.

A former tenant of Upper Court Lodge Farm, Woldingham, 760 feet above the sea-level, and on the Chalk, removed to a farm between Edenbridge and Limpsfield, on the low-lying Weald Clay, 190 feet above the sea-level, and found quite a different air there to that at Woldingham. His new experience cannot be given better than in his own words :—

“The cold damp air seems sometimes to wrap round me and go to my very bones. I never knew anything like it at Woldingham.”

A resident on the Gault, Somers Road, Reigate, has occasion to be about two days a week at Woldingham, and sleeps two nights in the week at “The Tea-tree” there. He is subject to chronic bronchitis, and finds that the climate of Woldingham is doing him a great deal of good. He is always greatly troubled with cough in the night when sleeping at home, but on those nights on which he sleeps at Woldingham he is quite free from cough, and has sound, refreshing sleep.

A lady suffering from heart-disease, and living on the Lower Greensand at Bletchingley, at a point about 470 feet above sea-level, occasionally paid a visit of a week or so to Woldingham, the house where she visited being 750 feet above the sea ; and she invariably greatly benefited by her stay there, she could breathe more freely, could take more exercise, and she was always better. She found the air at Woldingham quite different from that at Bletchingley, lighter, drier, more invigorating and refreshing. The more relaxing character of the air at Bletchingley may not only have been owing to its lower altitude ; the more moist and less

healthy climate of the Gault Clay district in the north of the parish, and yet more, that of the low-lying Weald Clay, immediately to the south, may have mingled with and modified the climate of Bletchingley village lying between them, whereas the Chalk district of Woldingham, rising 500 feet at its nearest point above the Gault of Godstone and Oxted to the south, could not be affected by it at so great a height above it, and in every other direction Woldingham is in the centre of the Chalk districts stretching away for miles beyond Caterham in the west, Warlingham in the north, and Tatsfield in the east.

A former tenant of a farm at Woldingham, after twenty-four years' residence in the parish, was healthier and stronger than when he first came out of Lincolnshire. He belongs to a family inheriting a tendency to phthisis, and lost seven brothers, sisters, and other relatives from phthisis in one year in Lincolnshire. A daughter married and went to live in that country, and died of phthisis about a year after her settlement in Lincolnshire.

The owner of some property at Ealing became also the proprietor of a small villa-farm of four acres in a high-lying valley at Woldingham, and as the result of numerous visits there, he states that the air is drier and lighter than that of Ealing, and that he always feels much better, breathes more freely, and has a more buoyant feeling at Woldingham. The climate of this valley is no doubt much drier than that of valleys generally, not excepting even valleys in a Chalk district, because after about six feet of friable soil at the surface, the Chalk which, as a rock, would be porous, has its porosity greatly increased by its being in very minute fragments to the depth of forty feet from the surface-soil, after

which it changes into a firm bed of chalk, and in the heaviest rains no water stands on the surface, but passes through the soil at once, thus ensuring great dryness to the atmosphere, even in the valley. Another gentleman also, who has purchased some land in the same valley, and built a residence there, has been in much better health than when he was living on the London Clay in Essex.

Numbers of people applied at "The Tea-tree," Woldingham, for lodgings in 1886, for two or three weeks or so, and could not be accommodated; those who were, derived great benefit from their stay in that healthy climate, amid the beautiful scenery of the district.

"A spot which Dr. Epps had lately discovered, and which greatly delighted him, was Warlingham Common, a few miles beyond Croydon. It is part of a range of table-land on the Surrey hills (on the Chalk), a most salubrious spot, and there is charming scenery round about. His happiness in this place was very great, it became an enthusiasm. The increase of his usually buoyant spirits commenced so soon as, on his way from Croydon to Warlingham, he reached the high land at Sanderstead, some three miles from Croydon, for then he felt the chest relieved, and could breathe better." — *Biographical Notice of Dr. Epps attached to "Diary."*

An entry in "Diary" runs thus:—

"The salubrity of Warlingham was strikingly shown in several cases of patients whom I advised to go to that spot. I often recommended people whose lungs were affected to stay there, because I myself experienced so much benefit each time I went down. In some of these cases of chest affection the result was extraordinary, perhaps in no case more so than in that of my young friend, M. W., in whom consumption was arrested by a residence of some time on the Common. Pleasant indeed was it to mark the progress towards health, and very agreeable hours

we all passed together when the patient improved, and we could ramble about the Common and lanes of that delightful neighbourhood. November we find to be a beautiful month at Warlingham; in going along the exquisitely lovely lane leading from Warlingham to the Godstone Road, we are struck with delight; we are attracted by so many beautiful sights, it is like a new world, a fresh life, we feel a rapture we cannot describe."

Dr. Epps died in 1869, but his memory is still fresh in the neighbourhood; hosts of people used to come down to lodge at Warlingham at his recommendation, and old patients of his are still to be met with residing in the neighbourhood, or coming down occasionally, whose lives were saved through their coming to Warlingham.

A gentleman from Croydon, who with his wife and family occupied Westhall House, Warlingham, for several months in 1886, himself and every member of his family felt greatly benefited in health.

Sir W. Gull and his family occupied the Vicarage at Warlingham for several successive summers a number of years ago.

A gentleman who has built a house and now lives on the Westhall estate, and who formerly lived at Croydon, enjoys much better health now than when at Croydon.

The views from the south-western shoulder of the high-lying plateau on which Warlingham is situated are very lovely, and those commanded from the south and western parts of Woldingham are really magnificent; no one can ramble over this pure, dry, bracing, beautiful district without being benefited and delighted.

ADDENDA.

SINCE the foregoing was in print, some letters in Forster's "Life of Charles Dickens" have been brought to our notice, which so graphically portray the experience of that world-renowned writer, and are so strongly confirmatory of arguments advanced in this pamphlet, that we must supplement it with brief extracts, referring the reader to the above-mentioned work for the passages *in extenso* :—

"At times something more than a doubt will force itself upon me whether there is not something in a Swiss valley that disagrees with me. Certainly, whenever I live in Switzerland again, it shall be on the hill-top. Something of the goître and crétin influence seems to settle on my spirits sometimes on the lower ground."—Vol. i. p. 303.

"His letter closed with intimations of discomfort in his health, of an obstinate cough; and of a determination he had formed to mount daily to the top of the downs: 'It makes a great difference in the climate to get above there and come down again.'

"I cannot do better than give you an imperfect description of the results of the climate of Bonchurch after a few weeks' residence. The first effect is an almost continual feeling of sickness accompanied with great prostration of strength, so that his legs tremble under him. An extraordinary disposition to sleep (except at night, when his rest, in the event of his having any, is broken by incessant dreams) is always present at the same time. Extreme depression of mind and a disposition to shed tears develops itself. If the patient happens to have been a good walker, he finds ten miles an insupportable distance. If he

happen to have ever possessed any energy of any kind, he finds it quenched in a dull, stupid languor. He has no purpose, power, or object in existence whatever. When he brushes his hair in the morning, he is so weak that he is obliged to sit upon a chair to do it. If he should have caught a cold, he will find it impossible to get rid of it, as his system is wholly incapable of making any effort. It's a mortal mistake,—that's the plain fact. Of all the places I have ever been in, I have never been in one so difficult to exist in pleasantly. It's not hot, it's not close; I don't know what it is, but the prostration of it is awful. When I leave here, I must go to some cold place, as Ramsgate for example, for a week or two. The longer I live, the more I doubt the doctors. I am perfectly convinced that for people suffering under a wasting disease this Undercliffe is madness altogether. The doctors, with the old miserable folly of looking at one bit of a subject, take the patient's lungs and the Undercliffe air, and settle solemnly that they are fit for each other. But the whole influence of the place (never taken into consideration) is to reduce and overpower vitality."—Vol. ii. pp. 39-40.

It must be remembered that the letter was written in 1849, and that since that time there has been an almost revolutionary revision of medical opinion upon Therapeutical Climatology. The doctors of to-day (as may be seen from the consensus of opinion presented in this pamphlet) would certainly not be charged by Dickens with remaining in the rut of "the old miserable folly." The most eminent of the doctors even of that day, while Dickens was penning his indictment against them, was vindicating his profession against its applicability by the promulgation of that great axiom in Medical Climatology,—“Dryness, a free circulation of air, a full exposure to the sun, are the material conditions to be attended to in choosing a site for a residence.”