pressed the speaker with the efforts of Nature to heal these chronic lung diseases through the deposition of fibroid tissue. This resulted in the contraction of the affected portions of lung, and the compensative dilatation of the unaffected portions. Hence, the medicaments went with the air to the healthy portions almost wholly. Then again the nebulisation of fluids in inhalation was, as usually done, accompanied by a lowering of temperature; and this taken cold, the moisture became diffused during breathing, and was not deposited within either the bronchial or alveolar tracts. 2. The residual and usual amount of air within the lungs became mixed with the inhalants, and thus these medicaments become diluted and not deposited. Further evidence was mentioned in the speaker's calculations, showing a far greater exhalation of moisture in a cold, dry, as compared with that in a warm, moist atmosphere. The bacilli were thrown off in the moisture exhaled in a cold dry atmosphere, as found in well-chosen high altitude climates.—Dr. GIBSON (Newcastle) advocated the employment of dry inhalations, as of antiseptics, sedatives and tonics, as nitrate of silver, etc., in suitable menstrua.—Dr. WILLIAMS, in reply, thanked the Section for a good discussion, and claimed its acceptance of the majority of his conclusions. He quite concurred with Dr. Lindsay in the importance of the receptivity of the patient for phthisis, and, with reference to what had been said about inhalations, he had yet to learn how medicaments could be specially directed into the unhealthy portions of the lung.

CEREBRAL SYPHILIS: TWO CASES IN ONE FAMILY.

Presented to the Section of Medicine at the Annual Meeting of the British Medical Association, held in Glasgow, August, 1888.

By FRANCIS WARNER, M.D. LOND., F.R.C.P.,
Physician to the London Hospital and Lecturer on Botany.

M. P., father of the two boys whose cases I am about to give, told me that he contracted syphilis in 1868; he married in 1869, and is said to have lost all secondary symptoms in 1870. The first of the mother's eight pregnancies resulted in a stillborn child, then followed a child who died in convulsions when 3 months old; Henry was born in 1874; the next survived but one day; Percy born 1876, and three younger children who appear to be healthy, except one boy now aged 7 who still wets his bed.

Percy was brought under my care at the East London Hospital for Children in 1883. He was fairly well developed, but the epicanthic folds were pronounced; he was pale, flabby, and his skin felt cold, while his fingers were blue; no heart defect was discovered. His eyes appeared normal on ophthalmoscopic examination; no defects were seen in his teeth, and no scars could be found about the mouth or anus. Speech was very indistinct; he could only partially feed himself; he slept well and was clean in habits. Walking was clumsy, with irregular movements, and he often fell accidentally. The knee-jerks were rather increased; all these conditions were bilateral. As an infant he was jaundiced and had "snuffles," with raised and moist sores at the anus and mouth; they yielded to treatment in a few weeks. During teething ulcers appeared on the body and buttocks, lasting twelve months. It is probable that the boy never walked or talked well, but from 4 to 6 years of age he attended school, and though he learned nothing was thought to be healthy. He never had any fits. In 1883 he began to suffer severe head-pain, which came on in attacks with vomiting, such attacks becoming more frequent and attended with loss of control over the bladder. Mercurial treatment was employed without success. He soon had to leave school, being unable to walk there; headache and vomiting continued, and I have heard that he died in 1887 without the supervision of any fresh signs of importance to the case.

Henry P. appeared healthy at birth, and there is no history of the manifestation of the signs of syphilis in infancy; still we may infer that he was syphilitic from the history, the incisor teeth, and the brain disease. At six weeks old bilateral convulsions set in, and continued at intervals till he was six years of age, when they stopped. When nine years old he gradually became clumsy and dropped things. In 1882 he had a severe illness, and for six months was said to have "meningitis." There was a temporary squint and severe head-pain, with universal powerlessness.

He gradually recovered general power, but hemiplegia of the left side remained. When I saw him in 1883 there was complete left hemiplegia, with rigidity and athetoid movements of the fingers. The left face was partially paralysed. To sum up further notes to present date: traces of old optic neuritis exist, and the left upper incisor is defective, probably from infantile syphilis. On these points Mr. W. Tay and Mr. J. Hutchinson, jun., agree with me. The left pupil reacts well, but the right is larger than the left; it is inactive to light, but contracts slightly on accommodation. No keratitis. Left knee-jerk is exaggerated, the right normal. He is intelligent, and reads well, and has no head-pain. Mercury has been fully used, but no marked improvement has occurred. I last saw him two months ago, and his condition was practically unchanged. The left hemiplegia and the condition of the right pupil seem to indicate probable double lesion.

REMARKS.—These brothers appear to have suffered from syphilitic disease of the brain. It seems probable that there was some slight defect from birth in each case. Percy learned nothing at school, and Henry had a long series of fits in early childhood. In Percy the lesion was bilateral; in Henry there appears to be a double lesion, though each may have been more local than in his brother. The case of Percy was possibly a chronic meningitis similar to the case published by Dr. Fletcher Beach and myself in *Brain* (April, 1888), where a thick false membrane had grown over the convolutions and pressed upon them. In these two cases, as well as in that previously published, mercurial treatment was employed without success. It is interesting to consider whether a syphilitic taint may lead to defective development, as well as render the tissues of the brain, its membranes, and vessels liable to future pathological lesions.

THE PREFERABLE CLIMATE FOR PHTHISIS.

By CHARLES DENISON, A.M., M.D.,
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THE following is a synopsis of the author's argument, taken from the *Transactions of the Ninth International Medical Congress*, held in Washington, September, 1887. For lack of space, those portions only are copied in full which relate to the author's individual investigations in a climate peculiarly suited to the arrest of chronic pulmonary disease.

The proper sequence, as to the importance of different climatic attributes, is what the writer attempts to establish, and that is (1) dryness, (2) coolness or cold, (3) rarefaction, (4) sunshine, as opposed to their opposites, and (5) variability of temperature, as opposed to equability, being admitted as a necessity of these favourable attributes.

The argument is intended to apply to all climates, though the following, under the heading of Confirmative Propositions, are considered as modifying conditions: (6) marked diathermancy of the air to be preferred to the smoky atmosphere of cities or the dense air strata of moist currents; (7) radiation and absorption of heat by rocks and sandy loams better than latent absorption by water and damp clay soils; (8) mountainous configuration of country (quick drainage) contrasted with the flatness, etc., of level sections; (9) frequent electrical changes of atmosphere, also moderate winds (except in quite cold weather) preferable to continuous stillness of the air; (10) inland altitudes contrasted with sea air (total absence of land influence), but in certain cases sea voyages and island resorts to be preferred as compromise substitutes for high altitudes.

The discussion of this most important question of "Climatic Influence in Phthisis," to be fair must be general, with no unworthy prominence given to any one of its many elements. The subject is necessarily complex, and in order to reach right conclusions must be candidly considered, without reference to the convenience of the medical adviser or of the patient. Hitherto, the chief obstacles in the way of right conclusions have been:

1. Ignorance of the exact nature and progress of the disease, and
2. A lack of appreciation of the relative importance of different climatic attributes in its arrest.

With reference to the first obstacle, the writer accepts with confidence the germ theory of Koch, that is, that the bacillus of tubercle is the essential principle in all tubercular lesions. The worth of comparisons and conclusions as to climatic data largely depends upon the time involved and the area represented. It

was the value of the records of the United States signal service bureau, and the importance to the medical profession of condensing the averages of all climatic attributes in a convenient and graphic form, that led the writer to compile some eight million separate signal service observations into the Annual and Seasonal Climatic Maps of the United States, which are the authorities for many of the conclusions reached in this paper.¹ The proper sequence of these attributes, and the validity of their defence, are what need to be proved.

1. *Dryness versus Moisture.*—At the outset we should have a line of demarcation between these two opposing qualities of the atmosphere. It seems to the writer that the average of the combined hygrometric conditions of the atmosphere, for the whole inhabited portion of the country, is a fair division line between these two opposite conditions.

Of course temperature must be accounted for, as the capacity of the air to hold moisture varies so greatly according to this record, the variation being from about half a grain to the cubic foot at zero to nearly twenty grains at 100° F., when the air is saturated. This was the basis of the writer's *Rule for the Determination of Moisture and Dryness.*²

This rule was based upon the calculation of a table representing the average of the combined humidities of the air (cloudiness, absolute and relative humidity) for the whole United States and for every degree of temperature. The average of these three evidences of humidity were found to be 44½ per cent. of the time for cloudiness, 67 per cent. for the relative humidity, and consequently 67 per cent. of saturation for absolute humidity. These means were accepted by the late chief signal service officer (General Hazen) to be as nearly correct as could be determined. A rating table of means of these three attributes having been constructed for every degree of temperature,³ the following rule was formulated.

"First find for the given time and place the percentage of relative humidity and cloudiness and the absolute humidity in tenths of a grain of vapour to the cubic foot of air. Then compute the difference between one-third of these three and the standard number (the mean) given opposite the proper temperature in the rating table, and the result, *plus* or *minus*, will show the relation of the given climate to the average for the United States. An excess of six locates a place in moderate moisture, and over six in extreme moisture, while a deficiency of six belongs to moderate dryness, and of more than six to extreme dryness."

The graphic illustration of this rule, compared with mortality statistics, shows that the arrest of phthisis is far more surely to be accomplished as you go toward the extreme of dryness from the mean, than as you go in the opposite direction from the mean towards the extreme of moisture. Indeed, it is the very moist climates which furnish most of the cases to be arrested in the very dry sections.

However, in the writer's opinion, the chief argument in favour of atmospheric dryness is based upon the increased transpiration of aqueous vapour from the lungs, in a degree according to the dryness of the air breathed.

Valentine, Sanctorius, Lavoisier, Seguin, Dalton, and others have investigated the subject of transpiration, but not to differentiate between persons at different altitudes and temperatures. In the analysis of humidities already referred to,⁴ the writer made an attempt to compute this difference in transpiration.

He took Draper's statement as the basis of his calculations—namely, that the dew-point of the expired breath is 94°. (Candour compels expression of the suspicion—chiefly based upon the increased thirst and augmented respiratory activity in those who live in elevated and very dry sections—that the dew-point given may be too high for such dry regions. However, this is less than Dalton's estimate, who says the expired air is in a state of saturation; so we will call it that the expired breath is saturated at 94° F.) Two divisions of the calculations were made.

(1). Difference in vapour transpiration between a warm, moist (Jacksonville, Fla.) and a warm, dry climate (Yuma, Arizona). These two signal stations were chosen, and for the autumn of 1883, because their temperatures were the same, that is, 71.3°. An ordinary sized man was assumed to breathe eighteen times in a

minute (Quinlet), and to expire when at rest twenty cubic inches at each breath (Hutchinson, Flint, jun., and others), and that the loss of breathing—that is, the used-up atmosphere—from 1.70 to 1.50 in volume (Davy and Curvier) is made up by the expansion of the air in the lungs, through its being raised from 71.3° to the heat of the body.

The calculation resulted in the following table :

TABLE I.

Autumn, 1883.	Yuma.	Jacksonville.
Mean temperature...	71.3	71.3
Grains of vapour in saturated air per cubic foot at given temperature (Glaisher) ...	8.33	8.33
Mean relative humidity ...	0.428	0.774
Cubic feet of air breathed in 24 hours ...	300.00	300.00
Grains of vapour inhaled ...	1.070	1.934
Grains of vapour exhaled with dew-point at 94° ...	5.007	5.007
Vapour exhaled more than inhaled ...	3.937	3.073

Excess of Yuma over Jacksonville 864 grains a day.

This is the moisture thrown off from the lungs in a given dry climate in excess of that in the rather moist one of the same temperature and no exercise taken. When one makes an allowance for the increased respiratory activity due to exercise, he is enabled to realise the still greater difference in transpiration, as shown by Dr. Edward Smith's calculation that "one at sea-level, walking at the rate of three miles an hour, consumes three times as much air as when at rest." Ordinary every-day exercise of man would make this difference in transpiration, under the given conditions, equal to about a gill in twenty-four hours.

(2). It is when we make this calculation for places of different temperatures and elevation, that the argument becomes still more conclusive, for cold is probably the most important factor in the production of dryness, and elevation is not far inferior, because it in turn produces cold as well as expansion in the volume of the air. It is just to allow for elevation an equivalent to the proportionate rarefaction of the air, that is, if the pressure is one-fifth less (twelve pounds to the square inch) at Denver than at Jacksonville, then one-fifth more air will be breathed at the former station. In this calculation we will assume as breathing in both Denver and Jacksonville a good sized man, 30 years old, twenty breaths a minute, and thirty cubic inches per breath (Dr. Gréhan), ordinary exercise included, and for the same season as that used before. The result is as follows :

TABLE II.

Autumn, 1883.	Denver.	Jacksonville.
Mean temperature, degrees ...	50.4	71.3
Grains of vapour per cubic foot, at saturation, for given temperatures ...	4.44	8.33
Mean relative humidity ...	0.501	0.774
Quantity of air breathed in 24 hours, cubic inches ...	1,062,800.0	848,000.0
Or cubic feet ...	615.0	492.0
Amount of vapour inhaled at the given humidity and temperature, grains ...	1.364	3.172
Vapour exhaled at dew-point (94°), saturation being 16.69 grains per cubic foot (Glaisher), grains ...	10.264	8.111
Vapour exhaled above that inhaled in 24 hours, grains ...	8.900	4.939

Excess of transpiration in favour of Denver, 3.961 grains, or over eight ounces or two gills in twenty-four hours.

There are two important considerations which would further add to this difference in evaporation of moisture from the lungs in favour of the high altitude station :

(1). The expansion of the air in being raised in the respiratory tract from the lower temperature of the atmosphere to the higher temperature of the body.

(2). The increased amount of exercise naturally indulged in at the higher station, due to the stimulation of cold, electrical influence, etc., and the augmented effect of exercise upon the respiratory functions.

For the purpose of still further comparison it is instructive to take a cold, dry place in winter (Cheyenne, Wyo.) and a warm, moist one in summer (Charleston, S. C.) on the same basis (though Cheyenne is a little more elevated than Denver). The calculation is as follows :—

¹ Rand, McNally and Co., publishers, Chicago, Ill.

² *Moisture and Dryness.* Report made to the American Climatological Association, 1884. Rand, McNally and Co., Chicago, Ill.

³ See table on Map for Spring on Climatic Charts previously referred to.

⁴ *Moisture and Dryness*, pp. 27 to 29.

TABLE III.

	Cheyenne, winter, '83.	Charleston, S.C., summer, '83.
Mean temperature, degrees	23.2	81.2
Weight of vapour at saturation for given temperature, grains	1.30	11.38
Mean relative humidity	0.478	0.803
Amount of air breathed in 24 hours, cubic feet	615.0	492.0
Weight of vapour inhaled, grains	0.383	4.426
Weight of vapour exhaled at dew-point (94°), saturation being 16.69 grains per cubic foot, grains	10.264	8.111
Vapour exhaled above that inhaled in 24 hours, grains	9.881	3.615

Excess of respiratory evaporation in favour of Cheyenne in winter, over Charleston in summer, 6.266 grains, or 13 ounces.

If the two modifying effects previously mentioned were to be taken into consideration, together with the usually increased activity of the respiratory organs, in such cold as compared with such warm atmospheres, the result would show for Cheyenne in winter a daily passing off of vapour from the lungs of at least a pint more than for Charleston in summer. This calculation accords with the sensations and the greatly increased thirst experienced in cold, dry climates, especially when exercising. (How much the activity of the skin is relieved by this increasing pulmonary evaporation would be a very interesting problem to work out, if it could be done.)

This is the argument of the increased pulmonary evaporation due to the coldness and dryness of the air. It cannot be ignored, though the stated records of pulmonary transpiration may be modified by different allowances for elevation and the dew-point of expired air.

It is not claimed that dryness itself is an independent feature. On the contrary, it will be seen how every successful climatic constituent really favours or produces this one which is placed at the head of the list. (Aside from exceptional effects merely upon sensations, the only consideration which seems to be arrayed against atmospheric dryness is the announcement of Lehman that "the exhalation of carbonic acid is greater in moist than in dry atmosphere, temperature remaining the same."⁵ *Per contra*, Crawford's experiments prove that the pulmonary exhalation of moisture is much greater in low than in high temperatures; while Draper says twice as much carbonic acid is liberated with a temperature of 68° as at 106°. Well, then, a slightly lower average of temperature compensates for the little difference mentioned by Lehman. Besides, we are in favour of the cooler temperature for other reasons than because of the remarkable power cold has in drying the atmosphere. As Dr. Lombard expressed it: "In the altitudes the digestion, the muscular exercise, and the lowering of the temperature, increase and accelerate the exhalation of carbonic acid.")

2. *Coolness or Cold Preferable to Warmth or Heat.*—The importance of cold, in the composition of the curative atmosphere we seek, is hardly less than that of dryness. In fact, the two are so inter-dependent and necessarily associated they cannot be easily separated.

(1) How much atmospheric humidity is influenced by the element of temperature is shown by the sensational effect of cold.

Aside from the drying effect of cold upon the atmosphere already alluded to, low temperature has several remarkable as well as useful effects in the arrest of phthisis.

(2) Heat expands the air, so that the contrast between the temperature of the atmosphere and that of the body indicates the swelling effect cold air produces when full breaths are taken.

(3) Cold stimulates and heat depresses. This is a generally accepted proposition which needs no extended elaboration.

(4) The effect of cold in destroying or impeding germ life, especially the life of the bacillus of tubercle, is a most important consideration.

(5) The investigation of seasonal effects in phthisis shows the salutary influence of cold.

3. *Rarefaction v. Sea-level Pressure.*—The consideration of elevation is divided into:

(1) The effect upon other climatic attributes.

(2) The physical influence upon man in health.

(3) Its effects in disease, and the experience of invalids.

(4) The evidence of immunity from phthisis.

(1) We have already adverted to the influence of rarefaction in producing dryness and coolness. Its effect upon sunshine, diathermancy, variability of temperature, wind movements, radiation, quick drainage, etc., will appear as we proceed.

(2) As to the physical effect, on the arrival of a healthy individual in high altitude there is first an increase both in the frequency and in the depth of respiration. When adjustment to the new conditions has taken place, which requires a variable period, according to the altitude and the individual, the respirations are not nearly so much increased in frequency during rest, but the depth of breathing becomes habitually greater. This is shown by the large spirometrical records of those who live at great elevations, and the increased size of the chest in children and in resident adults. This is further shown by the necessity of the climatic change to supply the usual, if not augmented, demand for oxygen, which is to meet an increased combustion or change of tissues. The increased exhalation of carbonic acid, due to the chest expansion and lower air temperature, as well as the increased chest measurements in those invalids who are not so far advanced in disease but that the affected lung tissue can be returned to use (an effect noted in the writer's cases, as well as in those of C. T. Williams, Weber, and others) are in perfect accord with the habitual use of more air for all the purposes of living in high altitudes. There is a "pneumonic differentiation," as the inventors call it, going on all the time, and this is better than any spasmodic or artificial effect.

There exists an alternate greater pressure or density with expiration, and less pressure or rarefaction during inspiration with each respiratory act, that is, compared with the air pressure outside the body, and also compared with the usual change of density of the air in the lungs during respiration. This increased outward pressure within the lungs is especially salutary in chronic hypertrophies, etc., of bronchial and alveolar lining membranes, and it has a tendency to open up passages closed to the entrance of pure dry air. Some of the worst cases of phthisis are those where the air cannot reach the microbes or morbid products.

(3) It is this question of increased and lessened air pressure, the augmented respiratory activity and the rush of blood into and through the pulmonary capillaries, which seem to disturb the judgment of many physicians with reference to the liability to the occurrence of pneumonia or pulmonary hemorrhage in high altitude.

The writer has always maintained, and still holds, that there is no cause for fear if proper precautions are taken as to extreme elevations, and the character and stage of the disease existing in the lungs, that is, that there should be no spots of softened lung tissue (especially near the roots of the lungs) which are insufficiently protected by Nature's great conservative process—the deposition of fibrous tissue. Only those cases should be sent who can bear the expansion and augmented circulation without rupture of blood-vessels. In portions of lungs where there is no softening this increased pressure acts on the distended vessels as does a properly adjusted bandage to a swollen limb. The alternate crowding of the dry air against hypertrophied or diseased alveolar walls, and the suction directly applied through the push given to the circulation, tend to relieve congestion and clean out the products of morbid processes.

This increased action and the dilatation help to isolate caseous or tubercular portions, prevent the spread of infection, and promote the cicatrization or fibrinification of these affected parts.

As to pneumonic and hæmorrhagic cases the writer's later experience—and it has been considerable—tallies well with that tabulated in his report to the International Medical Congress of 1876, when records were presented of 202 consumptives who had spent a total of 350 years in Colorado. The pneumonic cases and the hæmorrhagic (without cavity) were by far the best influenced of all varieties.

(4) The question of an altitude of immunity from phthisis is important, because there is strong presumptive proof that those climatic conditions which prevail where phthisis seldom or never originates are best suited to arrest the disease when it has commenced elsewhere.

Reference must be briefly made to the considerable evidence of medical writers in favour of an altitude of approximate immunity from phthisis, which in America ranges not far from 8,000 feet in the south-western part of the United States to about 4,000 on the northern boundary.

While altitude is the governing element, all the associated

⁵ Lehman, *Physiological Chemistry*, Philadelphia, 1885, vol. iii, p. 414.

favourable conditions of the atmosphere, somewhat in the order in which I have named them, seem to go hand in hand, until they reach the climax of success in conferring a more or less complete immunity from consumption among the residents at the given altitude.

In illustration of this influence the records of the mortality from phthisis in the city of Denver during the last year might be cited. The health commissioner's report gives the total number as 195 deaths, of which only five originated in Colorado. [It is unnecessary here to refer to the effect such imported deaths from phthisis have upon the mortality statistics of a given locality.]

If the much better results were obtainable from the country, instead of from the city, and from a little greater elevation, say at or above 6,000 feet, the immunity would most likely be more apparent.

4. *Sunshine as Opposed to Cloudiness.*—The proportion of sunshine to cloudiness depends on the length of the day, the exposure of a given place, whether or not concealed in a valley, and on the cloudiness of the sky.

The distribution of clouds in the United States is computed by the signal service bureau in tenths of obscuration of the sky, and from these observations the percentage of cloudiness, and conversely of approximate sunshine, can be noted for the whole country. The variations for cloudiness range from above 60 per cent. of the time over the interior lake region, down to less than 30 per cent. in the south-western portion (New Mexico and Arizona). Taking so broad a field into calculation, a striking harmony is noted between cloudlessness or sunshine, and the other favourable attributes.

5. *Variability versus Equability.*—How uniformly variability goes with dryness and equability with moisture, can be illustrated by the daily and monthly ranges of temperature at places which represent dry and moist climates. Chosen without reference to this particular evidence, twenty-five dry and twenty-five moist prominent stations and health-resorts in the United States give the following means:—

	Means of Daily Ranges.		Means of Monthly Ranges.
1. Extreme dryness.....	36.51°	...	53.65°
2. Moderate dryness ...	20.63°	...	49.38°
3. Moderate moisture ...	17.09°	...	45.48°
4. Extreme moisture ...	13.61°	...	41.55°

Again, taking the fifteen most and the fifteen least variable signal stations in the United States for 1883 (out of the 136 stations), we have the following daily ranges averaged by seasons and for the year:—

Fifteen Stations.	Spring.	Summer.	Autumn.	Winter.	Year.
Most variable.....	30.7°	29.1°	28.4°	26.5°	28.7°
Least variable ...	12.1°	12.9°	10.8°	12.0°	11.9°

The first are extremely dry, and the second fifteen decidedly moist localities.

It is not claimed that extreme variability should always be sought for, nor that of two places, with all other advantages the same, the more variable one is the better. On the contrary, the less variable would certainly be preferred in cold weather. It is claimed, however, that variability is quite a uniform constituent of dry high climates, and that as the dryness predominates the marked variability is less felt, and is less, if at all, objectionable. On the other hand marked atmospheric equability, wherever found, is *prima facie* evidence of excessive humidity. The worst that can be said against combining variability with the favourable attributes of climate for phthisis, is that its defence is necessary because it is a *sine qua non* of the preferable combination. Very well, but there would be no excuse for advocating a false theory of climate, even if this one element were unfavourable. There is a prevalent exaggeration of the effect of temperature changes. The change gets the blame which rightly belongs to the element of humidity, which constituent is always excessive when a given change is injurious. For instance, a change of twenty degrees from a warmer to a colder temperature, with relative humidity 50 per cent., does not equal, in sensation or shock to the system, a change of eight degrees with relative humidity at .80. The former change does not produce saturation, but the latter does, so does a change of five degrees with humidity at .90, and even two degrees with humidity at .95 (see Glaisher's table). Therefore, it is the humidity of the air which, through conduction of heat from the body, makes a slight temperature change, with air near saturation, equivalent to a much greater change with the air dry.

It is toadyism to the mistakes of medical antiquity for equability to be any longer insisted on as a constituent of the best climate for phthisis. It is all right and essential for humid climates, but for dry, cool, and elevated resorts it is out of the question. There is something wrong with the reasoning powers of an author who jumbles together climatic attributes so that his "ideal climate" has no real counterpart among the known climates of the world. The trouble is chiefly with the vague use of the words equability and variability.

Besides the quality of stimulation, which is associated with variability, there is an important consideration in the purifying of the atmosphere which variability indicates. This happens through the alternate expansion by heat and contraction of the air by cold, together with the nightly chilling and sometimes freezing which regularly renders it inimical to germ life.

Omitting the consideration of the confirmative propositions, the following are the author's conclusions as to the adaptation of the preferable climate to the needs of pulmonary invalids.

There is nothing more evident about this discussion than that the element of altitude is inseparable from the best climate for phthisis. A natural question then follows: What is the limit up to which this combination of qualities can be carried that the best results may be obtained? The answer is, it is a question of individual adaptability.

The best method of conclusion is to determine what conditions or diseases are suitable for the extreme of the preferable combination of attributes, and then arrive at modifications or rejections of the high climate cure by a system of exclusion. This is the position always held by the writer, and he is pleased to see the confirmation of it by the experience of Jaccoud, as given in his late work on *The Treatment of Phthisis*. Jaccoud's conclusions are in the main correct, but it must be borne in mind that they pertain to a more northern latitude than we reason about in the United States; that the gradual rise, distance, and peculiar protection of our interior altitudes make the change from low levels less severe here. Also, that we in America have an immense advantage over most European high climates, in that we keep up the curative effect by suitable increase of altitude in summer. Instead, they are compelled, as Davos, St. Moritz, etc., to give up the chosen climatic treatment during the warm weather.

The plan of deciding if the preferable climate can be utilised in a given case by exclusion because of negative conditions, will not be readily accepted by the advocates of the low climates. This is because, generally speaking, the more reasons there are for exclusion from the better climate, the less likelihood is there of an ultimate recovery.

Sometimes it is not an easy matter to decide what change of climate a given patient shall have, because of the many varying considerations to be weighed, both as to patient and climate.

We may only summarise by saying the preferable climate for the great majority of consumptives in the United States varies according to the case from 1,500 feet elevation in the North in winter, to 10,000 feet as a possible extreme in the Southern portion in summer. As to patients, not omitting social and economic bearings, it varies all the way from hopeless cases with almost no discernible lung lesion, to probably successful ones, with marked pulmonary destructions; as well as from the usual mild remediable cases (simple chronic inflammations) to severe incurable ones.

Of course, then, any rule of procedure must be susceptible of much variation, and the physician who takes the most factors into account, and weighs them best, will be most successful in the management of each individual case. With this broad proviso we state some general contra-indications to an otherwise preferable high climate.

1. The coldest season of the year, intensifying the effect of altitude.
2. Advanced age of the individual, rendering acclimatisation difficult.
3. An excitable, nervous temperament, aggravating the stimulation of climate, producing irritability, and sometimes wakefulness.
4. Women, for a like susceptibility, and less adaptability to the change and to out-door life than men.
5. Valvular lesions with rapid action of the heart, especially with the previous exceptions.
6. Marked and extensive emphysema, pneumothorax, and hydropneumothorax.
7. Active pneumonia of existing hæmoptysis. If these are re-

cent, the contra-indication is much less than if they are present; if remote and without other objections, these diseases are most favourably influenced by the change. If there is reason for some doubt, in any such otherwise favourable case, a gradual rise in elevation should be chosen.

8. High bodily temperature, whether it be rather constant, as in some inflammatory states, or in catarrhal extension beyond a tubercular zone, or whether it be regularly vacillating, as in tubercular infection, that is, daily low or subnormal in the morning and up to 103 degrees or more later in the day, especially with suspicious laryngeal complication.

9. Extensive involvement of lung-tissue in diseased action, that is, so that the healthy spirometrical record is more than one-half abridged. Of course advanced stage of disease renders this contra-indication much stronger.

10. The stage of softening, if accompanied by marked pyrexia, or in one of decided hæmorrhagic diathesis.

LOOSE BODIES IN JOINTS.

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I HAVE delayed replying to the able and courteous comments by Mr. Sheild and Mr. Howard Marsh (*JOURNAL*, March 31st and April 14th) on my letter (*Loose Bodies in the Knee-Joint*, March 17th) in order that I might give the consideration to the subject which their remarks demanded, and that I might examine certain specimens which I have only lately had the opportunity of seeing.

My statement was that we have a ready and sufficient explanation of the formation of these bodies in the growths from the synovial membrane into the joint; that only by an extraordinary and violent accident could a piece of cartilage or bone be broken off into a joint, and that necrosis could scarcely be credited as a cause.

With regard to the first of these points (the formation of loose bodies from the synovial membrane, which is generally admitted), I will go into a few particulars. The synovial membrane, which is continuous with the articular cartilage as its epithelium is continuous with that of the epithelium existing upon the surface of articular cartilage in early life, is prone, under morbid conditions, to the formation of cartilage and bone in its substance. This may take place in the villous processes which exist adjacent to the articular cartilages, about the lines of reflection of the membrane and at other parts, and which are not infrequently, in the normal state, found to contain cartilage cells; and it may also take place in the substance of the membrane, more especially in the vicinity of the articular cartilages, and sometimes as an outgrowth from them. A local irritation, a sprain, a wrench, or a blow may give rise to these villous outgrowths, or to one or two of them, in the otherwise quite healthy joint; and the villous outgrowths projecting into the joint becoming cartilaginous, and perhaps osseous, becoming also pedunculated, and finally detached, and losing, it may be, all trace of their former connection, constitute, as commonly admitted, the ordinary mode of formation of loose cartilages. This is more often observed to take place in a localised or isolated manner, so as to produce one or two loose cartilages, in early life, in young men and boys, whose active movements render them especially liable to sprains, and in the knee-joint, where the extent and reflexions of the synovial membrane are so great and so numerous, where the range and variety of movements are exceptional, and where the leverage against the joint given by the long thigh and leg is greater than in the case of any other joint.

In some instances these bodies soon give rise to symptoms which lead to their removal. In others they remain before or after their detachment in snug quarters or recesses, and cause little trouble, affording perhaps no indication of their presence, till by some particular movement, or strain, or blow, they are dislodged, get into inconvenient positions, give rise to the well-known symptoms, and are found slipping about in the cavity of the joint. Thus a man, aged 63, from whom I removed one of these bodies, stated that when he was a boy the "knee used to slip out of place at the inner side, and used to kink at the joint." Twenty years ago a piece seemed to break away; and from that time it used to slip about in the joint, and it became larger and more troublesome. A young gentleman had for years suffered weakness and uneasiness in the knee, and peculiar sensations at

the back of the joint, consequent on a sprain in childhood; but the cartilage, which was quite loose, appeared in the front of the joint only a few weeks before I removed it.

A schoolboy, aged 15, whilst playing at football, fell with the left knee bent under him. He contrived to walk home, a distance of half a mile. Synovial inflammation followed, and was for some months easily re-excited, but subsequently subsided. Two years after, whilst walking in the street, he suddenly felt a severe stabbing pain in the joint, and was for some hours unable to extend it. Similar attacks, followed by synovitis, recurred, and a loose body was felt on the inner side of the patella. Having made a subcutaneous incision through the synovial membrane, I slipped the body into the tissue outside the joint, and secured it there. This was three years ago, and the body, which was about the size of a horse-bean, now feels about the size of a pea and has given no trouble.

I removed a loose body from the knee of a young man, who experienced severe pain in the joint three months previously, when straddling across a ditch gathering watercresses. He was set fast and could not move from his position without assistance. The pain subsided in a few minutes, and he was able to walk and jump over a ditch. Next day the joint was swelled, and had to be kept on a splint. The loose body was discovered a few days afterwards. On two occasions, one three years and the other a year previously, he had experienced sudden pains in the knee, but less severe than the last attack.

During this period in which they remain in retirement, as it were, they may slowly enlarge and undergo calcification or ossification in the middle; and the section of such a body may show a nucleus or centre of true bone with the characteristic corpuscles, imbedded in true cartilages with the process of ossification from cartilage to bone progressing in the ordinary manner. These loose bodies are in some instances fibro-cartilaginous, in some cartilaginous, in some fibro-cartilaginous at one point and cartilaginous at another; and the cells near the surface may be, as seen in a specimen I have just examined (a loose cartilage of the ordinary type with bone in the middle, recently removed from the knee of a young man) flattened out and lying parallel to the surface, whereas the deeper cells are more spherical and arranged more or less in vertical columns, thus simulating very closely the structure of articular cartilage. Such a body may therefore present closely the appearance of a portion of bone and cartilage detached from the articular surface of a bone. I do not think the last feature has been previously pointed out; but in reality such arrangement of cells in the superficial and in the deeper strata is by no means, as seems to have been thought, peculiar to articular cartilage and to be regarded as diagnostic of it. It is indeed a feature common to cartilage in various parts and under various circumstances. Thus it is found in the costal and laryngeal cartilages as well as in loose cartilages, also in the superficial layer of the cartilage covering ordinary exostoses in parts where the whole thickness of the cartilage is not occupied by the columnar arrangement of the cells preliminary to ossification.

My attention was first seriously drawn to the formation of these bodies from the examination of the loose body removed from the knee of the young man last mentioned, which consisted of bone and cartilage, was flat and oval (an inch by an inch and a half), and was on one side bare of cartilage and presented a plain surface of bone, so that it much resembled a portion of articular cartilage and bone. Indeed, it was much like the specimen figured 4 and 5 by Mr. Howard Marsh in the paper referred to. The explanation I then gave of the condition was, that during a long period of repose this body had not only undergone central ossification, but that one side of it, through contact with, and perhaps attrition upon, the femur or tibia, had been deprived of cartilage, and its bony nucleus had been laid bare. This view certainly seems to me much more probable than the supposition that it was the result of direct injury or of a process of necrosis separating it from any part of the articular surface of the bones. The view that in this and similar cases the origin and progress was such as I have mentioned derives corroboration from a specimen in the Pathological Museum at Cambridge, where a subspheroidal or flattened osseous body with cartilaginous margin hangs by a broad peduncle from the synovial membrane into the space between the patella and the femur. The cartilage from both the patella and the

¹ One in the museum at Vienna, which still retains its connection with the capsule of the knee-joint, is said to be as large as the os calcis. Tillmann's *Lehrbuch der Allgemeinen Chirurgie*, p. 467.