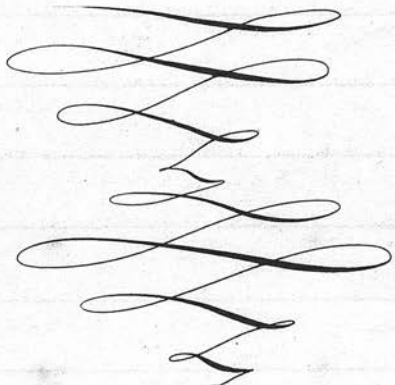
Wood

THE Etiology OF Climate



Julius John Wood

Preface

To all beings endowed with reason the physical phenomena of creation afford a field of study and research in which it rejoices the mind to be exercised; And so varied and peculiarly adapted are the provinces of this wide realm to the capacities of different minds, that one almost deems it strange that the attention of each thinking being is not arrested by the symmetry the beauty and the Grandeur of Nature.

Besides the wonderful and perfect laws which govern matter in its purely physical condition, (I mean uninfluenced by created being) there are other substances, than matter, and other laws no less wonderful than those controlling material phenomena, and in some respects analogous to these.

It has been doubted indeed whether mind has any existence apart from Matter, and such doubts as still entertained though by many Eminent authorities in Science; - but, doubt as these Philosophers may

most authorities upon the subject agree that the existence of mind is at least as certain as that of matter:— Still I think it will be admitted that of the nature of mind when separate from a material organization we know less than we do of it as inhabiting the human form. Of the wonderful effect of mind we have a good example if we compare or rather contrast the puny compass of the human body with the much larger muscular development of many of the lower animals, his servants, and again contrast the puny efforts of the animal with the stupendous and complicated contrivances and gigantic achievements which man is enabled to employ & accomplish.

In pursuing the study of man, as all must more or less do who engage in the pursuit of Medicine, the observer has no light task before him — Mind and the laws thereof are little understood — and even the laws of matter with which philosophers are better acquainted

are but little known comparatively in relation to vitality and reason.
It is not my purpose in the few following pages to enter upon such a wide field as the relation of organism to life and mind opens up, nor yet to investigate any of the aberrations from the standard, which occur in either but rather to enquire into some of the causes which produce in the human family such varieties as obtain in various parts of the Globe, and point out a few of the agents producing changes in health and disease, in as far as these changes are attributable to the influence of Climate.

The Etiology Of Climate

In many treatises professing to deal with the subject of "Climate", the writers overlook the importance of having a definition of what they mean by the term. But it will not do in writing upon this or any subject to go upon the supposition that every-body knows what the terms employed simply became they are used by everybody - Before entering upon the Consideration of some of the causes of Climate let us have a definition of what the term means -

In books it is seldom defined so that we are compelled to define it ourselves. By the Climate of any place we mean the sum of the atmospheric influences acting at that place, including in them the operation of substances suspended in the air, or acting through it or transmitted by it - as light heat - Electricity &c.

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In this sense the atmosphere in which an individual is, produces his Climate for the time being, so that the farmer, the lucifer-match maker and the needle-pointer, have each a distinct Climate differing very materially in the Effects produced. But a Consideration of the subject from that point of view would open up too wide a field for consideration here.

According to this definition Climate may be of various kinds it may be hot or Cold, mild or rigorous, bracing or relaxing, healthy or unhealthy. What most people desire who have any wish in the matter is, to have a Good Climate. But what is a good Climate? What we think depends upon several circumstances - for what would be a good Climate to an Lapp or an Esquimaux and promote their health and happiness should not suit the Arab or the Negro of Tropical Africa, nor could the former withstand the un-

invited sun and burning soil of tropical lands — The Swiss, though thriving among their own mountain-valleys, could not so well sustain life among the Llanos and Pampas of South America, and as little would the inhabitants of these endure a transportation to the Italy Alps We see in this as in many other respects how much man is the creature of habit, and, (upon the supposition of one parent stock) how his constitution may be strangely altered to suit the various climates which obtain in different regions of the world.

Besides the directly Climatic, other elements exercise much effect upon men of different climes under various circumstances: for instance where animal food is abundant and the soil rich in vegetable life, the habits of the people and their consequent development will be widely different from those of a race whose sustenance is from its scarcity to be sought over a wide area, Thus entailing much exercise

And

causing greater hardihood and physical development — Nor will such influences affect the bodies alone of the natives, but their imagination and the whole tenor of their intellectual and mental operations will be moulded by the physical phenomena around them. and the modifications produced by these in their domestic and other arrangements.

Among the phenomena which are most important in producing or maintaining different kinds of climate, that of temperature or sensible heat is perhaps the first. The heat of the surface of the earth is now known to be, chiefly, we may say wholly due to the sunsrays, and the temperature of any place is directly according to the amount of these rays, their vertical direction and the time during which they fall. Besides these modifying circumstances there are various others hereafter to be mentioned which interfere with the universal application of this rule.

The

The direction of the suns rays, the most important of the causes of heat, (at the sea level at least) is chiefly affected by latitude - The temperature of places between the tropics is as a general rule greater than those further removed from the equator, although the points of equal average temperature are not all equidistant from the equator -, the lines of equal temperature or 'isothermals' are not parallel to it.

It is an obvious fact that the nearer to the perpendicular that rays fall upon any surface the more are absorbed and that when the angle of incidence is gradually enlarged more and more of the impinging light and heat are thrown off and lost - Now the sun being perpendicular for the longest period over the Equatorial region, that (roughly) is the line of greatest heat. In other parts of the tropics where his beams fall vertically during a shorter period the average heat of the year is proportionally less.

less, and in the Temperate Zones his heat and light-giving power are still more diminished –; But it is in the Polar regions the homes of eternal ice and snow that the effects of the marked obliquity of the sunlight together with its total absence during considerable periods point most plainly to the Sun as the source of heat to this planet. Besides affecting the general temperature of the Zones of the Globe the lengthened or shortened time of exposure to his beams, and their greater or less obliquity have also marked influence upon the Climate of particular districts and localities.– This a fact is familiar to farmers and gardeners in this Country, who for this reason prefer land with what is called a Southerly exposure – that is Sloping towards the Sun. The influence of the Slope of the land upon its Climate is everywhere visible e.g. in the greater warmth and milder climates of those European Countries which border on the Mediterranean and in

in the Southern portions of our own shores
Altitude has much to do with the temperature of a place -
From various observations it would appear that the temperature of the air diminishes in a fixed ratio as we ascend, so that even at the tropics & equator the climate of a place will vary (so far) as its height above the sea - Altitude though interfering with the temperature which would exist were the surface of the earth uniform in contour, affords by its modifying influence a confirmation of the opinion that the sun is the source of heat to the earth. And also supports the view that the air is heated chiefly by contact with the heated earth. From its effects we also see that the direction of the Suns rays is not the only essential for a warm climate nor yet situation between the Tropics.
As in different latitudes we see distinct forms of Animal and vegetable life so from the lofty Equatorial lands to the sea level we have a similar arrangement, the

The Conditions induced by Altitude being such as to permit of the Existence of even alpine forms at the Equator. When the elevated region is a single mountain, or a chain of these, the effects of its Elevation are seen much lower than in the case of table lands of the same Level, - for the former are like distant members of the body, or like spikelets of grass on a frosty night - they readily part with their heat - We find for instance that the Himalayas have the limit of perpetual snow, at 15,500 feet much nearer the Sea Level on the South side of the range than it is to the North - at 19,000 feet but the cause of this appears in the elevated table land to the Northward.

The surface of the earth is as little uniform in Composition as it is in configuration - and as different substances have different relations to heat to the Temperature varies somewhat according to the Composition Nature of the surface - most obvious variations is noticable when the Temperatures of Sea & Land are compared. &c

It is matter of common observation that land is more easily heated than water but that the latter does not cool so readily. Water heated through the day retains its heat till late in the night, long after the surface of the earth has cooled and in the forenoon when already the earth is warm the water remains cold.
Now what is the effect of this upon the air - It is simply this, that the air which overhangs water exposed to the suns rays, sympathises with it, so to speak and is more equably heated during the twenty four hours than the air over land in similar regions. Extreme degrees of heat and cold are to be met with over land most removed from sea, while ocean temperatures are much more uniform.
The atmosphere of which we are now led to speak - derives its heat chiefly from the earth and sea while but little of its sensible heat is derived from the suns rays - As light passes through the

the atmosphere much of it is retained. Horizontal sunbeams passing through about 200 miles of atmosphere before they reach the eye must lose much of their original intensity. Heat however — unlike light ~~which~~ which when retained by the atmosphere gives rise to various phenomena &c. in some degree to our twilight from its being reflected from the particles of air — does not impart any of its peculiar properties to the media which it traverses. The air however contains watery vapour which arrests both light and heat and consequently raises the temperature

The fact of the existence of a high degree of internal heat is now undoubted as regards the earth, but this it appears though excessive in the lower strata, has no appreciable effect on the general surface. - This is due to the non-conducting nature of ~~the~~ external parts of the earths crust. Its influence is however shown locally in the presence of volcanoes and hot springs which [illegible] affect the average local temperature but very little. The

The other ordinary sources of heat as Friction, Percussion, Chemical action and accumulated Electricity have not much direct influence upon temperature in general, but there is one other mode of the production of heat which must exercise some influence on the ~~temperature~~ climate of those regions where the conditions for its manifestation obtain. When dry substances are moistened the temperature is observed to rise considerably, the elevation differing according to the substance employed. Thus pulverised mineral substances when moistened raise the temperature two degrees, while of thread wool ivory dried paper &c some raise the thermometer as much as 197. Now a cause like this operating over a large area will give rise to remarkable changes in various ways - and it may be that to this among other agents is to be attributed the transformation - wonderful in its rapidity - that is noticed in some of

of the regions of the new World and elsewhere - the almost instantaneous appearance after rain has fallen, of vegetable forms in profuse abundance on the formerly arid prairie and desert.

The terms heat and cold as used popularly mean that heat is present in greater or less degree but also that the heat is manifested either as a gain or a loss. The atmosphere is however often really much colder, and at other times much hotter than, judging by sensation alone we would conclude; for heat ~~and~~ or cold are less felt when the air is still than when it is in motion, — when there is much moisture in it than when none is present. So that our varying sensations under the same temperature, and also those of different individuals under the same conditions show us that the sensibility of the human body to the influence of heat and

Cold

Cold is not a good criterion of temperature - still it is more according to these sensations and the resulting changes that we judge of the character of Climate and Season.

Currents of air and Water exercise a potent influence on the distribution of the ~~heat~~ heat of the different Zones and Strata of the air and also have much to do with the variations in time, and the consequent changes which produce marked effect upon the climates of various Countries.

Currents of air may for convenience sake be classified as Tropical, Temperate and Polar - though some of them extend over all three regions.

It results from the greater heat before referred to as occurring at the Equator, that the air in that portion of the Earth, becoming heated & expanded, becomes lighter and ascends. This gives rise

rise to an upward current which having ascended falls on towards the poles. The air to the N. and S. of this region rushes in to supply its place. Thus are formed two currents of air well known as the trade winds - their direction resulting from the combined influence of their tendency towards the Equator and the faster motion of the Earths surface on which they travel compared with the region whence they come. In the northern hemisphere the ~~trade~~ trade winds extend from about 10° to 27° in the Pacific ocean, and as high as 30° lat. in the Atlantic.

The disposition of land prevents that uniformity there which is found at Sea In the Southern ~~hemisphere~~ zone again the Trades obtain from about 10° N. lat. to the tropic of Capricorn, in both Oceans.

For a certain space (between 5° & 10° N Lat) on either side of which the trade winds prevail is a region free from such regular currents and known as the region of

of Variable winds and Calms.
The air before alluded to as spreading in the upper regions and falling over towards the poles is not of course felt as a wind on the surface in these regions but upon the summits of Teneriffe and some of the Sandwich islands this wind is felt at a height from about 12,000 to 18,000 feet as a strong south-westerly current. While the clouds below are at the same time seen to be hurried along by the North East trade.
These statements as to tropical winds hold true for the Atlantic and Pacific oceans, but in the Indian and Elsewhere deviations occur.
In the Indian and Indochinese waters the region of Calms is wanting, as are the regular tradewinds, down excepts. The prevailing winds are termed Monsoons, which appear to be the result of the more regular currents modified by the peculiar distribution of the land.
The Monsoons are periodical steady winds

winds blowing in different directions at different times of the year and varying in direction in different places.—
Within the area of this prevalence we find the dangerous Typhoon of the Chinese Seas which occurs in Summer and Autumn. Destructive Hurricanes also have their favourite haunt in this vicinity. their rest appearing to be in the East Indian Archipelago & the N.W. of Australia, where the S.E. Trade wind and the N.W. Monsoon meet. They occur from January till April.
Almost the only other exceptions worth mentioning, are the Hurricanes of the Northern hemisphere. These prevail in the American Waters on the East side of the New world— They usually come from the E. or South-E. course along the Northern shores of South America and traversing the West Indies go off to the North or N.E.
In Tropical regions there are temporary & local winds — Eg. the Sand and Sea breezes

breezes which exercise considerable power in affecting the temperature of places near the coast, at different times of the light & day -

In the Temperate Zones the winds are not so constant as between the tropics. The high wind from the equator gradually loses heat and approaches the surface of the Earth, where it is met with at about lat 50°. In this Country we often experience its warmth - and as it carries much moisture it is always the cause of decided fall in the barometer: It is a west or south-west wind with us - the motion given to it at the equator along with its northward tendency combining to produce this result. In the Southern hemisphere the analogous wind comes from the N.W. The current of cold air from the poles also appears in the temperate Zones of both hemispheres as a north east or east wind.

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In the Polar regions the direction of the prevailing winds is towards the Equator.

Such is a brief and general Sketch of the principal air currents, most important agents in modifying temperature

Of the streams of ocean less is known, but the principal courses are pretty well made out.

One of the most important Currents is the Gulf Stream with which all are more or less acquainted

Crossing the atlantic in Equatorial regions is the parent stream of this wonderful salt water river.

It splits upon Cape St Roque in S. America whence its waters are directed by the lie of the shores and ground. North and south to warm the colder seas of higher latitudes.

The Gulf Stream after coursing round the Carribean sea and

Gulf of Mexico (whence it derives its name) coasts the peninsula of Florida and finally divides off the N. American coast into various currents - recrossing the Atlantic in different directions - One branch rejoins the Equatorial Current from which it sprung; another passing Southward in the region of the Canary islands forms a current off the W. coast of Africa; a third visits our own shores and raises the mean temperature of western Europe while a fourth does the same good office for Iceland and the northern ocean. A current of cold water from Baffins bay and the Coasts of Greenland meets, and to some extent mixes with the waters brought Northward by the Gulf Stream, off the coast of Newfoundland. Constant winds like the Trade winds and Monsoons occasion surface currents or drifts as they are termed.

Duct

Next to temperature, Moisture is the agent which gives the greatest variety to Climate. The winds previously noticed carry more or less moisture, for this is one of the most constant components of the atmosphere. Those Air Currents from the Equator known among Countries in our own latitude as N. & S.W. winds, convey much aqueous vapour which their exalted temperature enables them to bear high in the Atmosphere.

In this region various causes upset their equilibrium and some of the moisture is parted with and falls as snow or hail or rain:

These winds thus convey to our Country and others similarly situated the heat of tropical Zones and moreover in the case of Europe they transmit, besides, the heat derived from the Gulf stream as well as their own to those Countries whose Coastline is towards the W. & S. W.

The current from the poles to the Equator, met with among us as East and North East winds, carries a much less amount of moisture, and even that comparatively small quantity, near the ground became of its low temperature. So that although the barometer is seldom high during an east wind, the moisture is apparent as East Haar, sometimes accompanied by rain or sleet or snow.

Besides their coming from regions possessing different temperatures there is another reason for the peculiar character of each of these winds - It is this - that while the former passes over much ocean surface and originally Spring from tropical seas the latter have traversed the arid plains of Russia & Central Europe whence but little moisture can be derived.

The moisture of a country is regulated very much by the nature of the prevailing winds, its proximity to the tropics and its distance from the sea.

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In countries near the tropics there is generally speaking more rain than in other parts of the world, the rainfall gradually diminishing towards the poles. Within the tropics as much as 300 inches and even more may fall annually while in high latitudes as e.g. in Siberia the rain fall is reduced to 12 inches as the mean annual amount.

In some regions no rain falls.

This is the case in a large district of the old World Comprising the Sahara desert, & parts of Egypt, Arabia Persia and Central Asia. Along the Coast of Peru and in some parts of Mexico this entire absence of rain is likewise observed. The cause of this exceptional peculiarity is partly the intercepting power which the lofty mountains in the vicinity of some of these districts exert in stopping the further progress of Clouds and of condensing the moisture of the prevailing winds. The absence of rain from the

Sahara and Parts of Egypt & Arabia
maybe due in some degree to the
distance of these regions from the ocean
& the absence of winds from the sea – but
perhaps is more to be attributed to the
nature of the country and the intense
heat thus developed.

Besides the power which hills possess of
abstracting moisture from winds and thus
rendering the countries on which these
pass, ~~xxxx~~ drier even to the extent of
depriving them of rain altogether,
they possess other influences upon winds.
To these they may give direction, thus
rendering certain localities more exposed
at one time than another to particu-
lar winds, or by their peculiar disposition
around they may protect from noxious
gales while allowing of more favourable
and healthy breezes. But the vicinity
of mountains is generally apt to be
visited by impetuous and sudden
gusts, and when the hills are snow
capped such winds are severely felt. –

More

more especially are they observed to be hurtful when, as is sometimes the case, they make their sudden descent into valleys and districts whose climate is at other times genial and warm. Good illustrations of this species of Climate are to be found along the Mediterranean Shores of Europe. In Italy especially is it observed for there the Tramontana from the snowy ravines and summits of the Apennines alternates with the still hot and parching Sirocco.

There may be however too much shelter from winds - many of these are pleasant and conducive to health - indeed a certain amount of motion in the air is essential to the health of a district. If there is no breeze to carry them off, vapours and malaria arise and infiltrate the stagnant atmosphere and render life if not hazardous at least uncomfortable - This is the case in some of the Swiss Valleys which, deep, long and tortuous, seem to defy even Alpine

Gales

gales to penetrate this miasmatic stagnation.
In these localities it is that Cretinism
and goitre have their abode, and there
diseases have been attributed in some
measure to the close and unhealthy air.
Referring again to the fall of rain he
would observe that although more rain
occurs near the Equator – it does not
follow that the rainy days are more numer-
ous in that zone – In a region which may
be called Equatorial, and which corresponds
to that of the variable winds & calms
rain falls almost constantly. North and
South of this belt the rain falls during
six months the other six being dry –
In the Indian ocean and the Countries
and islands adjoining rain falls during
the S.W. Monsoon (from April till October)
while during the N.E. Monsoon (Oct to April)
the weather is dry –
In the Temperate Regions the regular rains
are as little seen as regular winds – and
frequently wind and rain bear each
other Company the former is seldom without
the latter – In

In Europe the countries where most rain falls lie to the West and South — where they appropriate the moisture of the cloud bearing Atlantic gales. In these the period of greatest rain-fall is Autumn. In the central countries of the continent in Russia and Siberia also the time of greatest rainfall is Summer.

Summer rains are also the rule ~~in~~ the Eastern parts of North America — constant rain occurring in some parts, and the rainfalling in Winter in the interior. As to the Southern parts of the globe Patagonia has a Summer rainfall on the East coast & a winter one on the West, while at Cape Horn constant rain or snow persist. Winter rains are the rule in South Australia & New Zealand and an Autumn fall at the Cape of Good Hope. In regard to Tropical regions the time of rain falling is pretty certain, but in the Temperate zones rain may fall any day of the year.

Again although rain generally falls by day in the tropics — that rule does not hold in ~~[illegible]~~ or temperate region. The

The character of winds that have crossed over a large extent of water differs more from that of a land wind - and sea winds and land winds differ as much among themselves as they do from each other. - Various writers take notice of the effects of particular winds upon the system. It is stated that in Andalucia when the Solano - an east wind - blows, quarrels become more frequent and in the trials which often arise this fact is in part admitted as excuse. If the order of these events were reversed the sequence would be more apparent to British minds we think.
At Gibraltar the Levante is during its occurrence a source of unusual discomfort At Toulouse the Autan a dry and irritating wind seems to have the effect of causing nervous tension.
At Naples the Sirocco is said to cause depression of mind and during its stay operations are thought dangerous.
At

At Madrid the air is peculiarly keen and penetrating and this is in part due to the naked character of the surrounding district which renders the wind passing over it dry and cutting, the high elevation of the country giving a lower temperature and rarer atmosphere. These effects of peculiar winds on the mind and body are stated to be independent of temperature — They seem generally to be produced by winds which have passed over a large surface of land, dry and of considerable elevation.

These are the chief causes in producing the different climates of ~~the~~ countries whether they be near the poles or the equator, and varieties of climate to be found within these countries themselves are also principally caused by the operation of the agencies which we have been considering.

Other agents there are which have some influence in changing temperature

or affecting in some degree the Causes already noticed but they are of comparatively small account.

As instances of these we might name the occurence of rivers; Electrical phenomena; Drainage, natural or artificial; Vegetation naturally or artificially disposed. Geological Formation and the Nature of the Soil — as well as its Colour. The last mentioned is the most important but its influence is not constant nor of the first consequence.

Having Considered the Causes of Climate — a word as to its effects upon visiting Madeira and Teneriffe Humboldt thus remarks

"No country seemed more fitted to dissi-
"pate melancholy and restore peace to an
"agitated mind than Teneriffe & Madeira
"where the natural beauty of the Situation
"and the salubrity of the air conspire
"to quiet the anxiety of the Spirit and
"to invigorate the Body"