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AN ESSAY

ON THE

CLIMATE AND FEVERS

OF THE

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by the Author*

South-western, Southern Atlantic and Gulf States,

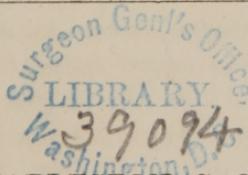
EMBRACING

*A brief exposition and defence of the existence and essential nature of
Malaria; accompanied and illustrated, with a Medico-Topogra-
phical and Meteorological account of the Dead Sea Region.*

BY

JAMES C. HARRIS, M. D.,

OF WETUMPKA, ALA.



CHARLESTON, S. C.:

WALKER, EVANS & COGSWELL, PRINTERS,

Nos. 3 Broad and 109 East Bay Streets.

1872.

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TO

William O. Baldwin, M. D.

OF MONTGOMERY, ALA.,

No less on account of his high Professional acquirements, than as a token of
personal regard,

THIS ESSAY IS INSCRIBED

BY HIS FRIEND,

THE AUTHOR.

WETUMPKA, ALA., November 1st, 1872.

PART FIRST.

Under the impression that it is the duty of every physician to record, in some form or other, the result of his experience, we have occasionally, for the last eighteen or twenty years, contributed through the Southern Medical press, brief notices of the *climate* and *diseases* of particular *localities* and *regions*. Of some of these crude attempts at authorship, not only the substance, but frequently the language, without further notice or acknowledgment, will be found scattered through the following pages. In addition to this it will also be observed, that to enable us to illustrate some of our peculiar *climatic* features, we have been compelled to draw largely upon the labors of others; but in every instance we hope it will be found that we have done so in an acceptable manner. With these brief *introductory* declarations, we will, after first defining our geographical limits, and giving their general geological outline, proceed to present as succinct, but as clear a view of particular localities, together with their meteorological phenomena, and principal *fevers*, as the nature of our undertaking and materials will justify.

In the following pages we comprehend as constituting the South-western, Southern Atlantic and Gulf States, all that region of country extending from near the *Tropic of Cancer*, to a little above the *thirty-sixth parallel* of north latitude, and lying entirely between the first and thirty-eighth degrees of longitude west from *Washington*. The whole of this great region (with the exception of the western part of New Mexico, and the territory of Arizona), with its eastern, southern and south-western limits, resting on the Atlantic Ocean and Gulf of Mexico, and lying within the mountain ranges, and high lands presently to be briefly sketched, if not naturally, may for the purpose of description, be divided into the *lower*, or *level*, the *middle*, or *undulating*, and the *upper*, or *mountainous regions*. The level or undulating *zones* with an average elevation above the Atlantic Ocean and Gulf, of not more than four hundred feet, are com-

posed *geologically* of the Tertiary and cretaceous formations, to which succeed in the mountainous regions, the *metamorphic*, *carboniferous* and *primitive*.*

The relations existing between this region, the Gulf of Mexico, and Atlantic Ocean, are of such an intimate and natural character, we do not believe the climate and endemic influences of the former, can be properly understood or fully appreciated without at least some knowledge of the principal *currents, temperature, and winds of the latter*. Upon the first of these subjects, we are informed by marine hydrographers, that a portion of the great Western *Equatorial* current, after striking against the eastern projection of South America, turns to the north, and passing through the *Caribbean Sea*, enters from one of the *hottest regions* on the globe, through the Straits of *Yucatan*, the Gulf of Mexico, where after mingling with its waters, and performing in it a kind of circuit, flows out to the north-east, through the Straits of *Florida*, at the rate of four or five miles an hour, as the well known and celebrated *Gulf Stream*. As the waters of the northern shores of the Gulf are known to be cooled by the approach of *winter*, northern *winds*, and the influx of *river currents* from higher latitudes, upon the same *principle* the temperature of its southern and middle portions must be greatly *increased*, by the unceasing introduction through the Straits of *Yucatan*, of a large amount of *warm water*; and which we think more than probable, under the influence of a *south-west wind*, in passing out east around the Capes of Florida, exerts to a considerable extent the same modifying influence on the climate of *Georgia* and the *Carolinas*, that the Gulf is known to do under similar circumstances on the more Southern States of the *Mississippi Valley*.†

Mountain Ranges, commencing on the east, nearly under the thirty-sixth parallel of north latitude, and perhaps not more

*The geographical, topographical and geological descriptions contained in the following pages, besides the sources mentioned in the text, have been chiefly condensed from Colton's Atlas, Monteith's and McNally's geographical series, No. 5. Woodbridge, Morse, and Mitchell's geographies, the Medical Statistics of the United States Army, and the works of Drs. ~~Forney~~ and Drake.

†It appears that Dr. ~~Forney~~ (Climate of the United States, pages 87 to 90,) thought the influence of the Gulf Stream was nearly altogether expended in warming (from Cape Finisterre to North Cape) the western coasts of Europe.

Forney

than one hundred and fifty miles from the *sea shore*, a continuation of the *Appalachian range*, under the name of *Blue Ridge*, leaves the State of Virginia, and passing around through the *Carolinas*, in a south-westerly direction, parallel with the ocean, and ranging from fifteen hundred to three thousand feet above its level, terminates in North-eastern Georgia. North-west of this mountain range, ranges of the Alleghany and Cumberland mountains, under different names, extend down into North-western Georgia, and North Alabama. North of the thirty-third parallel in Alabama, ridges and spurs of the latter range, where they turn to the west, sink down to nothing more than an elevated range of hills, and approach the Mississippi river, in the direction of the Ozark mountains.

Turning now to the west and commencing some four or five meridians east of the Rocky Mountains (which here constitute the western boundary of the Mississippi Valley) nearly under the twenty-fourth (24th) meridian and twenty-eighth parallel, a spur of the *Sierra Madre*, proceeding in a north-easterly direction, from near the junction of the *Rio Pecos*, with the *Rio Grande*, enters Texas near the source of the *Neuces River*, and continuing in this direction, crosses the Colorado some distance below the mouth of the *San Saba*, and is finally lost in the undulating lands of the *Brazos*. To the north-east of this mountain range, with a supposed elevation of from eighteen hundred to two thousand feet, lie the *table lands of Texas*. Near the eastern margin of these, and of which they are nothing more than a rugged continuation, commence the *Ozark Mountains*, which, after sending off some lateral spurs to north-western Louisiana, cross the upper portion of the State of Arkansas, and terminate near the Missouri River. From the eastern base of this range, the distance across to the first spurs of the Cumberland Mountain, an outlier of the Appalachian range on the east side of the Mississippi, is not more than two hundred miles. Through this *great gorge*, the Mississippi River, a little to the west of the twelfth meridian, enters the central and northern portion of the region we have under consideration, and from which point, in its general course as far down as the mouth of *Red River*, it gradually inclines to the south-west, thence south-east to its confluence, nearly under the same meridian.

Standing on the shore of the Gulf of Mexico, near the mouth of the Mississippi, with the face turned to the *north*, all of that portion of the South-western, Southern, Atlantic and Gulf States, lying to the south-east and north-east of this *river line*, is recognized as the *eastern* portion; and that to the southwest and north-west as the *western*.

The principal rivers, with their tributaries, washing the eastern section, commencing on the east, are the Cape Fear, Pedee, Santee, Savannah, Ogeechee, Altamaha, St. Mary's, St. John's, Suwanee, Apalachicola, Alabama, Mobile, Tombigbee, Pearl and Yazoo; all of which, excepting the St. Mary's, St. John's and Suwanee, have their sources either within the Appalachian range or some one of its numerous outliers, and discharge their waters into the Atlantic Ocean, the Gulf of Mexico, or the Mississippi River. The St. Mary's and Suwanee, rivers of Georgia and Florida, have a common source in the Okefenokee swamp; the St. John's in an immense swamp in Orange County, Florida.

Those on the west, with their tributaries, commencing on the south-west, and extending around to the north-west, with the exception of those of Western New Mexico and the Territory of Arizona (which originate from the western side of the Rocky Mountains), are the Rio Grande, Neuces, San Antonio, Colorado, Brazos, Trinity, Sabine, Red, Washita, Arkansas and White. Of these rivers the Rio Grande, the Red and Arkansas, have their sources within the Rocky Mountains, the Neuces, San Antonio, Colorado and Brazos among the spurs of the Sierra Madre; and the Trinity, Washita and White, from the table lands of Texas, and spurs of the Ozark Mountains; they all discharge their waters into the Mississippi and Gulf of Mexico, either directly, or through large bays or estuaries. Those of New Mexico and Arizona, the Colorado of the west, the Gila, and two of the principal tributaries of the latter, the Santa Cruz, and the Rio Pedro, into the Pacific, through the Gulf of California.

Subdivisions.—*The Carolinas and Georgia* are naturally divided into three strongly-marked regions, the lower, the middle and upper. The first two of these lie on the great Atlantic plain. The lower country, extending from sixty to ninety miles from the sea shore, is nearly a dead level, traversed with slug-

gish streams, and filled with innumerable ponds and marshes. The soil is scanty and poor, excepting along the margins of the streams, where it is frequently rich. Back of this flat country, and extending to the lower falls of all the principal streams is a belt of from forty to sixty miles in width, of moderately uneven surface and sandy soil. The low grounds between the sand hills of this zone are suitable for agriculture and pasturage; but with these exceptions, this region is scarcely worth cultivation. The natural growth of both of these districts consists principally of the different varieties of pine, black jack, cypress and gum. Beyond this region, and above the falls, commences a beautiful country of hill and dale, and fine flowing streams of pure water. The whole of this region may be regarded as an elevated table-land, gradually rising to where the Apalachian range passes through these States. This up country has generally a strong and fertile soil, of a red color, mixed, in places, with a deep black mould, producing cotton, Indian corn, wheat, and other kinds of grain in great abundance. Its principal forest trees are the different varieties of oak, pine and hickory.

The southern coasts of these States are skirted by a range of *islands* which are separated from the mainland by *salt marshes*, intersected by numerous creeks, and subject to *overflow*;—and from each other by arms of the sea, which are the outlets of the rivers from the mainland to the Ocean. Their soil, which extends only but a few inches in depth, consists principally of sand, mixed with shells and vegetable mould, and is very unproductive. Like the neighboring continent, they are *low and flat* and covered with a forest growth, consisting principally of live oak, water oak, bay, gum, pine and palmettoes.

The *Atlantic Plain* in Georgia extends from the coast to the lower falls of all the principal streams, and embraces the *lower*, or level and the *sand hill* or undulating regions.* The mainland between the Savannah and Altamaha rivers, adjoining the salt-marshes, which divide it from the sea islands, usually commences with a line of bluffs, which rise some twenty or thirty feet above the level of high water. These bluffs are separated from each other by arms of *salt-marsh*, and small streams of fresh water. These streams originating from a range of sand hills

*Chiefly condensed from the report of Jno. F. Posey, M. D., Southern Med. and Surg. Journal, 1858, p. 106—191.

twenty or thirty miles further inland, have a tide flowing a distance of ten or fifteen miles above the bluffs; and for about the same distance further they are margined by a fresh water *marsh* or *swamp*, from half a mile to a mile in width, with strips of higher land between them. The sand hills commence with an abrupt rise of about sixty feet, and form a comparatively level plain, and gradually increase in height as they extend inland, and to the north, until they are lost in the commencement of the upper or table-land region. The valley and river swamps of this region in some places are covered with water, and a heavy growth of cypress, in others they are dryer and covered with such trees and bushes as delight in a damp rich soil. What is commonly called "*rotten lime stone*" probably underlies this whole region, the water of which when reached in digging *wells*, is generally impregnated with what appears to be *putrid* animal matter, which renders it very unpalatable, and in the general opinion unhealthy. South of the Altamaha river, after leaving the tide-way, the soil and surface is described as consisting superficially of either a dark gray, or black mould, with an argillaceous substratum, to the depth of five or six feet; in some portions of this region, during dry spells of weather, the surface becomes so hard that it is almost impervious to the *plough* or *hoe*, and cracks in every direction, forming extensive fissures, of considerable depth.

This region of country known as the *low-lands*, and invariably, on account of its insalubrity, abandoned by the planters in the early part of June, is during a very *wet* or *dry* season almost entirely exempt from severe grades of *remittent* or *congestive fever*.

Immediately above the *low-lands* in Glynn county, the surface of the country suddenly rises some eighteen or twenty feet; the soil of this region is sandy and poor, the growth consisting chiefly of pine and black jack. On the south, in Ware county, is the great Okefenokee swamp, supposed to contain half a million acres of rich *alluvial* land. As this rather unexplored region is believed to be somewhat higher than either the Gulf or Atlantic ocean, a survey has been ordered by the State for the purpose of settling the matter, and testing the practicability of its *drainage*. To the north of this swamp in the counties Lowndes and Colquit, the surface of the country, although some-

what undulating throughout its southern half, is generally level, and interspersed with shallow ponds, some of which are timbered, whilst others are entirely destitute of trees; these ponds which are usually nearly or quite dry during the latter part of summer or autumn, are during the rainy season of *winter* and *spring* filled to overflowing with water. The water courses of this region which lies upon the Mexican Gulf slope, have a general southern course, and are all tributaries of the Suwanee and Ochlochong rivers. There are some isolated portions of this region, covered with a heavy growth of oak, hickory and magnolia. The margins of the creeks and branches are wooded with cypress, bay, gum, water oak, live oak, and a dense undergrowth of evergreen *shrubs*. The soil is a sandy loam, underlaid with clay at various depths from six inches to several feet.

The pine lands are moderately productive, yielding, corn, cotton, potatoes, rice and sugar cane. The hammock lands are more productive, but probably not more durable. Very little has been done as yet in the way of reclaiming bay or swamp lands.

About midway between the Atlantic and Gulf coasts, the daily summer temperature varies from 90° to 100° ,—but has never been known to exceed at any time 102° . The nights after nine o'clock are seldom oppressively warm. The gales, that so frequently prove disastrous upon the Atlantic coast, are seldom observed here, whilst those of the Gulf coast, particularly in the western part of this region, are sometimes very severe.

Its Endemic Influences.—In some localities in this region, as Augusta and Savannah, all the *grades* and *types* of *malarial fever* prevail, whilst in others, as on some of the *sea islands*, and in the *sand hills*, only the milder grades and simpler forms are met with. Upon this subject, we are informed by Dr. Posey, upon the authority of Dr. P. M. Kollock, of Savannah, that the inhabitants of the *sea islands*, that have but few or no brackish ponds, or lagoons upon them, enjoy a much greater immunity from *malarial fever*, than those residing upon the opposite mainland; we are also further informed that *yellow fever* has prevailed in the *port* and city of Savannah, from 1817 to 1845 inclusive, seven times. In 1817 and 1819, it originated on ship board amongst the *unacclimated seamen* and *passengers*, and did not

spread. The other visitations, although of an epidemic character, appear also to have been clearly of *local* or *domestic origin.* It also appears there prevailed in 1852, in Effingham county, as the result in a majority of the cases of neglected *bilious fever*, a remarkably fatal *typhoid fever.*

Alabama.—For the purpose of description, this State may be divided into North and South Alabama. Its southern portion, which consists entirely of Atlantic Plain, lies north of a line, commencing at Columbus, Georgia, latitude $32^{\circ} 25'$ north, and running west-north-west, by Wetumpka on the Coosa, Centerville on the Cahawba, and Tuskaloosa on the Black Warrior, terminates at or near Columbus on the Tombigbee in Mississippi, in latitude $33^{\circ} 30'$ north. The southern portion of this region, bordering on the Gulf of Mexico for the space of fifty or sixty miles, is low and level; the shores of Mobile bay being skirted with salt marshes and cypress swamps; beyond these the surface of the country gradually becomes a little more elevated, and is covered with a forest of long leaf pine. The remainder of this part of the State may be divided into the four following natural divisions: the *alluvial*, the *cane-brake*, *prairie*, and *pine-woods.* The first of these lying along the creeks and rivers, and in some places subject to inundation, was in the first settlement of the country, covered with a dense growth of cane, interspersed with cypress and magnolia.

The second and third being identical in geological composition, in reality constitute but one variety, and extend over a greater portion of the counties of Sumpter, Green, Marengo, Perry, Dallas, Wilcox, Lowndes, Montgomery, Macon and the southern part of Russell, with, perhaps, the best specimens in Green and Marengo; the soil of this region consisting of yellow, pulverable limestone, intermixed with *recrements* of animals and plants, and resting on a strata of rotten limestone, is extremely fertile, and, although presenting but little diversity of surface, is occasionally broken into rounded bald knolls,* as may be seen between Arcola and Demopolis, and between Livingston and Sumpterville. The summits of these hillocks are sometimes ornamented with cedars, but more frequently they are quite bare, or covered with but a scanty vegetation. Even where the sur-

*Tuomey's 1st Geological Report, page 134.

face is but slightly undulating, bald spots occur, where the rocks come up to the surface, and are exposed to view; but perhaps the most remarkable feature of this section is the extraordinary power of its soil to imbibe moisture from the atmosphere. The effects of this property, continues the same authority,* is so strikingly illustrated in the uncleared parts of the canebrakes that one can scarcely satisfy himself that he is not standing on the low grounds of some great river. This region, owing to the impervious nature of some of its geological substrata, is without numerous streams, and, indifferently supplied with permanent springs.

The Piney Woods.—This region, the soil of which is of a light sandy nature, abounds in springs of pure clear soft water. The flat pine lands throughout the State, although they, frequently during the summer and fall months, contain a large amount of surface water, are more perhaps for the want of a certain character, than a sufficient supply of organic materials, generally healthy.

To the north of the line already indicated as separating North from South Alabama, the surface of the country gradually becomes more elevated and hilly, and in its extreme northern portion—mountainous.† The natural forest growth, throughout this region, may be said to consist principally of the different varieties of pine, and oak, maple, poplar, dogwood, gum, hickory, sycamore and ironwood. Although cotton is said to be the staple production of the State, in its southern portions, sugar cane, rice and tropical fruits are grown, in its northern, wheat, rye, and other cereals, and throughout *Indian corn*, in great abundance.

Geological Outline.—To the *alluvial* and *post pliocene* deposits around the shores of the Gulf of Mexico, succeed the tertiary and cretaceous formations; of these the tertiary overlaps the southern edge of the cretaceous in its entire extent across the State, “extending from the lower part of Sumpter, on the west, crossing the Alabama river near the mouth of Dixon’s creek, and thence across to a point above Fort Gaines, on the Chattahoochee. From this the cretaceous extends up to the lower falls

*Tuomey’s 1st Geological Report, page 136.

†Tuomey’s 1st Geological Report, page 136.

of all the principal streams," meeting on the west the coal fields of the Cahawba and the Coosa, and on the east the primitive formations, extending down the mountain spurs.

The mean annual temperature of South Alabama may be approximately stated at about 69° Fahrenheit, and that of the entire State at something near 66°. Although the southern part of the State is not subject to as great a thermometrical range as many other countries, or even its more northern and mountainous regions, the variations from heat to cold, are sudden and frequent, often rendering fires during the summer and fall months, after sundown, and blankets at night indispensable to comfort, when the heat of the preceeding day ranged from 70° to 96° in the shade. The winters are so remarkably *mild* that the rivers never freeze over, and the heats of summer near the coast, are greatly mitigated by refreshing *breezes* from the Gulf.

Rivers.—The principal river of North Alabama, which enters it at its north-east and leaves it at its north-west corner, is the *Tennessee*. Those of South Alabama, are the *Mobile*, the *Alabama*, and their tributaries, the *Tombigbee*, *Cahawba*, *Tallapoosa* and *Coosa*, the two latter forming the *Alabama*. The *Mobile*, about fifty miles above the city of *Mobile*, is formed by the union of the *Tombigbee* and *Alabama*, which latter is also a considerable stream, and is navigable for vessels drawing from five to six feet of water to *Claiborne*, sixty miles above its junction, and one hundred and fifty miles higher up, to the mouth of the *Cahawba*, it has four or five feet of water, and from thence to the junction of the *Tallapoosa* and *Coosa*, and up the latter to *Wetumpka*, it is navigable for light draught steamboats, with few exceptions, at all seasons of the year. The *Tombigbee* is navigable for schooners one hundred and twenty miles to *St. Stephen's*, and for steamboats, to *Columbus*, *Mississippi*. Of this stream the *Black Warrior* forms a large tributary, and is navigable to *Tuscaloosa*. The south-western portion is drained by the *Conecuh*; and the eastern by the *Chattahooche* river. The *Alabama* river, in flowing down from the high lands through an alluvial valley, generally presents a bluff on one side and a low bottom, subject to inundation, on the other. In many places the bottoms are from two to three miles wide, and before

being cleared up, were covered with a forest of cypress, sweet gum, magnolia and live oak.

Mobile, the chief commercial emporium of the State, is situated on the west bank of the Mobile river, at its entrance into Mobile bay, in lat. $30^{\circ} 40'$ north, long. 13° west. It is laid out on a beautiful and extended plain, elevated some ten or twelve feet above the highest tides, and extending back some six or seven miles to the commencement of the piney woods and tertiary plain. "Much of its site, which is somewhat terraced like the river bottoms of the interior of the great valley, is sandy, with beds of clay beneath, which prevent the rains from sinking into the earth, and lead to the formation of *swales*, or *marshy grounds*, that require ditching before they can be cultivated." To the south, adjoining the city, there is a cypress swamp, with its margin resting on an immense deposit of *silt* and drift wood, and which presents a foul and suspicious appearance. On the upper or north side of the city, and constituting to some extent its boundary, is a small bayou called One-Mile Creek, and beyond it another, named Three-Mile Creek, designations which indicate their distance from the city. On each side of, and between these sluggish streams, there are swamps over-shadowed with cypress, sweet gum, magnolia, and other shrubs, common in such localities of the South; these swamps never become dry even to the depth of two inches below the surface.

"In front of the city the bay abounds in islets and beds of alluvion, enveloping drift-wood, and covered with a heavy growth of reed grass, and other aquatic and sub-aquatic plants."

From the foregoing description, as might be expected, *Mobile*, besides being annually scourged with intermittent and remittent fevers of every *type* and *grade* of violence, has also experienced many *yellow fever* epidemics.

In ascending the *Mobile* river and its tributaries, we find standing amid the tertiary and cretaceous formations, *St. Stephen's*, on the *Tombigbee*; *Tuscaloosa*, on the *Black Warrior*; *Claiborne*, *Cahawba*, *Selma* and *Montgomery*, on the *Alabama*; and *Wetumpka*, on the *Coosa*.

Cahawba.—This town, once the capital of the State, stands on the west bank of the *Alabama* river, immediately below the mouth of the *Cahawba*, in latitude $30^{\circ} 20'$ north, longitude 10°

10' west. During high tides, the Alabama river overflows the entire town. To the north-west, at no great distance, extending across from one river to the other, is a considerable swamp. At present it is the seat of justice for Dallas county, and has never contained, since shortly after the removal of the capital to Tuscaloosa, in 1825, more than seven or eight hundred inhabitants.

From the first settlement of the country, this locality has been subject, during the summer and fall months, to violent and often fatal intermittent and remittent fevers. During the fall of 1821, and again during that of 1822, when its population perhaps reached upwards of three thousand inhabitants, it suffered severely from an epidemic visitation of *malarial fever*, described by Dr. Heustis,† under the name of "*bilious remittent or endemic fever*." Considering the histories and symptoms of these epidemics, interesting not only in a historical point of view, but worth preserving as illustrative of the influence of *physical causes* in the production and modification of *endemic fever*. We will now endeavor to present at least some of them.

"On account of the heavy rains, and high water during the spring of 1821, the low grounds and swamps adjacent to the Alabama and Cahawba rivers, during the early part of the season, were frequently inundated; so that it was late in May before many of the farmers upon them had an opportunity of planting. A considerable *freshet*, or rise in these rivers took place in July; and such was the quantity of rain that fell early in the summer, that many of the farmers were entirely frustrated in their attempts at planting; the earth being so completely *wet*, and inundated that the seed rotted in the ground; so that many were obliged to plant the same field three or four times, and then in several instances were doomed to lose their labor, and abandon the undertaking as hopeless."

"Such indeed was the situation of affairs, in many instances, upon the *river*; in others, less injury was sustained. Upon the uplands remote from the river, the crops came forward with considerable certainty and success, even there however the crops of *corn* and *cotton* were injured by the *excessive rains*, and re-planting became a business of equal necessity."

†Observations on the epidemic fevers of the Southern States, page 369.

“The average range of the thermometer during the month of June, 1821, was at seven A. M. 73° , two P. M. 85° , and at nine P. M. 77° . Throughout the month of July, the average temperature as indicated by the same thermometer, was at six A. M. 71° , at three P. M. 84° , and at nine P. M. 75° , making a mean temperature, through the day and night, of $76^{\circ} 20'$. During the months of August, September and October, the time of Dr. Heustis was so completely occupied by professional engagements, that he was unable to register the state of the thermometer; but thinks that the temperature of the month of August did not fall below that of July; and that there was no very perceptible change or depreciation of temperature, until the latter part of September.”

“To what degree the air we breathe may be corrupted, without endangering health, we do not know, but that it may be so to a certain extent there can be no doubt:—thus decomposition takes place at a temperature considerably below that which is necessary for the production of *bilious or yellow fever*, and in every climate and country, this process goes on to a greater or less extent, during the summer months. Now the natural effect of this decomposition is to vitiate the atmosphere; yet in high northern latitudes, the inhabitants remain perfectly healthy, at least entirely free from anything like the endemic fevers of *hot and tropical regions*; from which it appears, that it is only when the *aerial products of decomposition exist in excess* in the atmosphere, that they become the source of derangement and disease to man. Nor is our atmosphere ever *entirely* free from this impurity and the contamination of heterogeneous admixtures.”

“Towards the latter part of July, when the rains had measurably ceased, the water of the ponds and marshes considerably evaporated, and the river had fallen within its banks, the work of putrefaction went on with rapid strides, and *fever* began to make its appearance.”

“In the month of August, when the putrefactive process had probably reached its height, it was almost impossible to ride through either the town or country, or turn a corner, without being assailed by a disagreeable and noisome odor, resembling that of a sick room, where two or three patients are confined with the worst kind of fever. This smell was the most perceptible at the still, and damp hour of twilight, when the mor-

bific miasms, not being dispersed and scattered by the wind, were suffered to accumulate in the vicinity of the mouldering mass from which they originated, and by attaching themselves to the particles of falling *dew*, diffuse themselves in the atmosphere around. Of these mouldering ruins of *animal*, and *vegetable growth*, and *hot beds of disease*, there were no scarcity."

The symptoms of the disease, we are informed, did not differ *materially* during the seasons of its prevalence; with the exception that during the fall of 1821, it was more malignant in town, than it was in the surrounding country, and in 1822, milder in the former than the latter situation.

"During the early part of the season of 1821, *fever* and *ague* and mild remittents had been common, but as they yielded without difficulty, and were attended with little danger, they excited no alarm or apprehension. The summer continued tolerably healthy, until towards the latter part of July, when the disease began to assume a character more obstinate and severe. In August, it became still more unmanageable. Early in the month of October the symptoms again underwent a change. The tongue was clean and moist, even in the worst cases; though the tongues of persons in ordinary health, were all more or less *furred*; showing that all were impregnated with the *morbid poison*, or *matter of fever*; headache was common. The urine in some cases was of a yellowish green, or dark saffron hue, in others, small in quantity, and of a dark red, or brownish color, giving to the linen a *red tinge*; in some cases it was limpid and copious, whilst in others, it was thick and viscid, appearing to consist principally of vitiated bile. This was remarkably the case in one patient, Mr. Morong, whose body at the same time from the suffusion of bile, was of a dark olive hue. The body, neck and breast frequently turned black, soon after *death*, when this was not the case, it generally turned to a *deep yellow*."

"The spleen, liver, lungs, stomach, bowels and other viscera were often the seats of local congestion. The liver and spleen were subject to considerable enlargement from this cause. The stomach in many cases was affected with more or less inflammation, the patient often complaining of a burning heat, pain and oppression at the epigastrium; being at the same time affected with sickness at the stomach, and vomiting. The mat-

ters discharged by vomiting, after the fluids last swallowed, consisted most generally of a dark yellow viscid bile. In many instances, under the operation of an emetic, vast quantities of this were discharged; in others, the matters ejected from the stomach were of a *grass green color*, but much less in quantity than the preceding, and not uniformly blended, but of a flaky, viscid appearance, with a mixture of slime and mucus. In some, this matter appeared of a dark brown, in others approaching to *black*."

"*Hæmorrhages* from the *nose* generally took place in the early part of the disease, and were evidently owing to a great determination and consequent accumulation of blood in the vessels of the head. Sometimes *blood* was discharged from the *stomach* by vomiting; and *bloody stools* were still more frequently observed. In some cases, the flow of blood from the nose was very copious and obstinate; but its effects were generally salutary, though it marked an aggravated form of the disease. In one or two cases, *grumous blood* mixed with the *urine* was observed." Dr. Gantt, who resided in Cahawba during the prevalence of these epidemics, informed the writer, that several cases in which the urine was more or less mixed with blood, occurred in his practice, and that it was not at all uncommon for it to impart a rather red tinge to the sheets and clothing.

"Suppression of urine some times occurred, and in some fatal cases continued nearly two days, without being accompanied with any pain; though a copious secretion of *urine*, or kindly perspiration was a favorable symptom, it often happened that the paroxysms subsided, and convalescence was finally established, without any marked crisis in either of these secretions: yet, in such cases the bowels became free and solvent, easily operated on by laxatives—the morbid matter appearing to be evacuated by *stool*."

"In some cases, *eruptions* in the form of watery blisters appeared upon the surface of the body, more especially about the *mouth* and *nose*, and upon the *face*; which, upon breaking, formed into *blackish, scabby incrustations*."

During the prevalence of these epidemics, Dr. Heustis did not have the opportunity of making but one post-mortem examination. In this case, the stomach contained a considerable quantity of a brown, *coffee-colored fluid*, with a *black flocculent sediment*,

resembling soot; its inner surface was somewhat inflamed. The bile in the gall-bladder was black and viscid, resembling tar in appearance and consistence, and perfectly free from any tinge of green. During the season of 1821, when the disease was more malignant than it was in 1822, he witnessed a number of cases where matter similar to that above described, was discharged both by vomiting and stool."

Although Dr. Heustis has described, and we think very properly too, these malarial fever epidemics—attended in some cases with hæmorrhages and black vomit, and presenting the continued, remittent, intermittent, congestive, tertian and quotidian types,—under the name of the type variety (remittent) of paludal fever; he distinctly informs us that the disease was yellow fever, and that he might, with equal propriety, and in strict conformity with the then received nomenclature, have described it as such. As there are some who may, upon the ground of the want of familiarity upon the part of Dr. Heustis with this particular type of fever, pretend to doubt the correctness of his diagnosis, it is proper for us to state, to show that his experience was ample, that he speaks of the prevalence in 1809 of yellow fever under his care amongst the troops stationed at Terre aux-Bœuff; and in 1812 of a large portion of three companies of the first regiment of artillery stationed also under his care, at the Barracks in New Orleans dying with the same disease.*

In a very interesting review article, by Dr. J. C. Faget, of New Orleans,† we are informed, if we understand him correctly, that somewhat similar cases to those mentioned by Dr. Heustis, as occurring during the Cahawba epidemics—those attended with yellow skin, traces of blood in the stools and vomit; and red, or bloody urine—are called by the physicians of the island of Madagascar, at Cayenne in French Guiana, and in the West Indies—bilious hæmaturic fever, and at Pointe-a-Petre, island of Guadaloupe, where it is perhaps more prevalent than anywhere else, yellow fever of the acclimated, and of the creoles. In New Orleans a variety of Malarial fever with black vomit, has been frequently observed, sometimes in an epi-

*Medical Topography and diseases of Louisiana, pages 89-117.

†New Orleans Journal of Medicine, vol. xxii, October No., 1869, page 768.

demic form, and described by himself since 1853 under the name of *hæmatamesic paludal fever*, which so much resembles the true *hæmagastic pestilence*, that it was recognized by Drs. Delery and Fenner, together with a large majority of their medical brethren, as *pure yellow fever*.

Selma.—This city stands on an elevated sandy plain, on the (right) west bank of the Alabama river, ten miles above Cahawba, and, on account of existing and anticipated railroad facilities, has received, within the last seven or eight years, an accession of perhaps more than five thousand inhabitants, and has become a point of considerable importance. Notwithstanding the plain on which the city stands is free from ponds, there is, to the north and east, at no great distance, quite an extensive swamp.

It appears from a comparison of all the information that Dr. Drake was able to collect at this place and Cahawba, concerning autumnal fever,* that he was brought to the conclusion that the disease prevails less here than there, which might be expected, he thinks, from the difference in their topography. It has not been visited by yellow fever. The same authority continues:

“In a late paper by Dr. Harris, on the Medical Topography of South Alabama, I find the following paragraph :

“In 1824 the yellow fever appeared in Selma, and that section of the country known as Pleasant Valley, ten or twelve miles north. One case, under Dr. Phillips, terminated fatally on the third day after black vomit, and several cases under my inspection on the fifth and seventh days after the same; some in collapse. There was no yellow fever in Mobile at the time.”

“It is remarkable that Dr. Heustis, in his paper on the diseases of Cahawba, is silent on this alleged yellow fever, and that Dr. Lewis, in his Medical History of Alabama, has not adverted to it; and equally remarkable that, in the course of a rigid inquiry in 1848 into the fevers of that region, not one of its numerous physicians should have mentioned to me what Dr. Harris has since published.”

As it is stated in the paper from which the foregoing paragraph was copied by Dr. Drake, that the information it con-

*Drake, *Principal Diseases of the Valley of North America*, p. 186-7.

tained was given on the authority of Dr. Edward Gantt, we consider it nothing more than justice to that gentleman to state that he had previously in Philadelphia, as a Student of Medicine in the office of Dr. Rush, enjoyed opportunities of becoming familiar with the disease, and that he assured the writer he had never since met with, either in Mobile or New Orleans, better or more clearly marked cases of yellow fever.

From this period this locality escaped a recurrence of yellow fever until the seasons of 1854-5, when it again made its appearance and prevailed.

Montgomery.—This city, the capital of the State, stands amid the cretaceous formations on a sandy terrace, above high water mark, on the east bank of the Alabama River, opposite the extreme southeast extremity of a horse-shoe bend of the same, in latitude $33^{\circ} 10'$ north, longitude $10^{\circ} 12'$ west. A range of hills commencing rather abruptly on the southeastern limits of the city, and running around to the east, form a kind of amphitheatre of hill land in its rear, at some points of more than one hundred feet elevation, and giving to the principal part of the immediate plain on which the city stands, a decided inclination in the direction of the river. On the plain to the northeast, there are numerous ponds and marshes, which are thrown into forms more or less elongated and serpentine by oak and pine ridges or narrow plateaux, which gradually become more elevated and hill-like, but still embosom stagnant and swampy streams.

The upper stratum of this tract is a red sandy loam, with beds of silicious gravel. "To the west-northwest there is a margin of low and wetter bottom land, on the upper end of which attempts were once made to build a town, but it proved too insalubrious."*

Since the permanent location of the capital here, in 1847, this city has rapidly increased in population and commercial importance.

Montgomery has been, we believe, from its earliest settlement infested, to a considerable extent, with all the grades and varieties of intermittent and remittent fevers. In 1853 the yellow

*Drake, *Principal Diseases of the Valley of North America*, p. 387.

fever made its appearance here in a recognized and acknowledged form. It also prevailed the two succeeding years.

Wetumpka.—The towns of East and West Wetumpka, connected by a fine and apparently durable bridge, are situated on both sides of the Coosa River, at the foot of the falls of the same name, and head of steamboat navigation, in latitude $32^{\circ} 30'$ north, and longitude $10^{\circ} 15'$ west. These have been by legislative enactment, erected into and constitute one city, containing upwards of two thousand inhabitants, the court house and jail of Elmore County, several schools, six churches, and the State penitentiary.

The site of the western town is a sandy, level plain, cut and interspersed with an occasional ravine and swale, and terminating rather abruptly at the river bank, in high bluff. A small portion of this plain in front of the lower part of the town is subject to an occasional inundation. The eastern portion of the city, standing on an elevated, narrow and rather rugged plain, is so completely hemmed in with a range of high hills, extending its whole length, and rising several hundred feet above the level of the river, that at many points there is scarcely space enough between their base and the water's edge for the erection of the necessary business buildings. These hills, composed of a gravelly, dry, micaceous, red loam, sloping back with gentle declivities, and terminating in level tops, surmounted with a forest of pines, chestnut and scrubby oak, afford most desirable sites for the erection of private residences, and from one of which, to the admirer of the works of nature, the prospect is most enchanting. To the south and southwest, as far as the eye can reach, nothing is to be seen but one extended landscape, interspersed with forests and farm houses; while at your feet dash and surge the gushing waters of the Coosa. The agitation of these waters in their passage over the falls causes the evolution of a large amount of vapor, which, descending at nightfall in copious showers of dew, gives to the air in the vicinity an unusual, and at times, an unhealthy degree of dampness.

The river, after entering the limits of the city, runs for the first half mile in a southwesterly direction, when it passes under the bridge, and then shifts in its course more to the southeast; pursuing this direction for about a mile more, it then

turns west, and runs in a devious line to its junction with the Tallapoosa.

At low stages of the water the current of the river above the bridge is thrown almost entirely against the western bank, leaving exposed to the action of the sun a large portion of vegetable matter. There are also at low stages of the river, amongst the rocks and shoals, many pools of stagnant water, in which a mass of organic matter is continually undergoing decomposition; one in particular, commencing not far above the bridge, and extending some hundred yards up the river, is a fruitful source of exhalation; a large ravine also extends from the water's edge in the rear of the buildings on Bridge street nearly up to the market house, and receives the filth from the greater portion of this part of the city.

There are also other sources of disease of a local character, within the corporation, on both sides of the river, and also within the immediate vicinity, but as they are similar to those already described, and common to many southern towns and neighborhoods, we will pass them by without any further notice.

Notwithstanding Wetumpka stands on the last out crop of the cretaceous formations, and has been subject from its first settlement in 1833, to intermittent and remittent fevers, yellow fever, in an epidemic form, has never prevailed. True, we have during our residence here, late in the fall of several years, met with an occasional case of remittent fever, not only on the city plat, but also in the low alluvian grounds, four or five miles south, and for eight or ten miles up the Tallapoosa River, of so malignant a type, that since we have had the opportunity of studying yellow fever in the wards of the Charity Hospital, New Orleans, we are satisfied were sporadic cases of that disease.

In a paper on the causes and treatment of *jaundice*, as it appeared in this locality and its vicinity, during the summer and fall of 1847[†], we remark that the months of January, February and March, were not very remarkable for anything more than their great *moisture*, *low temperature* and *range*. April and May were throughout showry and cool; June, up to the 20th, was

[†]Western Journal of Medicine and Surgery, vol. ii, July No., 1848., p. 27.

dry; the remainder, together with the whole of July was exceedingly *wet*.

From the 1st to the 28th of August, the weather, with the exception of two or three light showers, was warm and dry. Between the 10th and 20th of this month *fever* made its appearance, and although we had a comparatively healthy season, *fever* continued to prevail throughout the remainder of the fall, but as a general rule of a mild *grade*. The months of August and September, with a comparatively high mean temperature, 81° and 76°, respectively, were the months in which the first cases of fever, accompanied with a yellow, or *jaundiced* color of the skin, made their appearance, under a continuation of an apparently similar occult atmospheric condition, but with a somewhat lower temperature and wider range, throughout the succeeding months of October, November and December; occasional cases of *fever*, complicated with *torpid liver*, and *yellow skin*;—and simple cases of jaundice, *without fever*, continued to occur until near, or even after mid-winter. In illustration to some extent of the character of the prevalent *fever* of this summer and fall, we will now introduce the following case, and fact: On the 24th of August we were called in consultation with Dr. S. Williams, in the case of a young man residing some twelve miles in the country, near the Tallapoosa river, in the low grounds of which he had been laboring as a field hand, up to the time of his attack some eight or ten days previous. Found him upon our arrival, *stupid*, and inclined to incoherent muttering when lying undisturbed, vomits occasionally without much nausea, a very *dark bile*, headache, bowels loose, passages consisting of a *dark grumous matter resembling a mixture of blood and bile*.

Skin over the whole surface of the body of an exceedingly yellow hue, tongue coated with a dark brown fur down the centre, and over the base, with red edges, adnata of the eyes, *yellow*, surface dry and hot, head and precordial region preternaturally so, most heat of skin and excitement of pulse between three and ten o'clock of the afternoon and night. Blister over the umbilical region, discharging very freely a yellow serum, *urine* scanty and of a deep yellow hue, tinging the sheets of the same color, pains in the loins, and large joints, with occasional *fits of restlessness*. Considering the condition of this

young gentleman hopeless, we advised nothing more than an anodyne, and took our leave; he expired some time during the night. Shortly after the occurrence of this case, (in September,) an overseer on a neighboring plantation, lower down the river, and nearer this city, *sickened* and *died* of what his physicians pronounced *Jaundice*.

Mississippi.—The surface of this State has a general slope to the south-west and south, and its principal rivers, with the exception of a small section to the south, have their courses in the same direction.

The coast, which extends along the Gulf of Mexico for about sixty miles, has a chain of low islands, six or seven miles from the shore. These enclose several bays or sounds, the largest of which are Pascagoula Sound and Lake Borgne. The southern part of the State, for about one hundred miles from the Gulf of Mexico, is mostly a sandy, level pine forest, interspersed with cypress swamps, open prairie and inundated marshes, with a few hills of moderate elevation. This region, by cultivation, produces cotton, Indian corn, indigo, sugar-cane, plums, peaches, figs, sour oranges and grapes. The western border, on the Mississippi, for about one hundred and seventy miles in length by fifty or sixty in breadth, and through which the Yazoo river flows, is an extensive swamp.

The prairie, or Tombigbee section, covering the north-eastern part of the State, and extending far down on the Alabama line, is uniformly level, with scarcely a tree, dotted here and there with pools and marshes, and intersected with sluggish streams. The soil of this region is a dark, heavy loam of surpassing fertility, and of the same geological composition as that of the adjoining prairie country of Alabama.

The upper portion of the State, known as the Chicasaw Cession, has a rolling surface, and an open champaign appearance, being free of undergrowth, and beautifully wooded with oak and hickory. The upland of this section produces abundantly, but the substratum of the country being sandy, the productions are soon ruined by the heavy rains. The valley lands are much more durable and productive, the soil being heavier and darker; but they are liable to be, and frequently are, submerged, acres at a time, under billows of sand washed from the uplands. Cotton is the staple product.

Jackson.—This city, the capital of the State, we are informed by Dr. S. C. Farrar, stands on the west bank of the Pearl river, in lat. $32^{\circ} 20'$ north, long. $13^{\circ} 8'$ west.* Geologically considered, it is near that well-marked boundary which separates the tertiary from the secondary formation, or, more particularly the cretaceous beds of the latter from the eocene marl of the former. "Between the river and town, to the northeast and southwest, lie extensive low grounds, covered by a dense forest, and subject to annual inundation."

For several years after the first settlement of this locality, it was subject to the most violent grades of intermittent and remittent fevers. Latterly, however, ~~these~~ *these* have become more mild and manageable; but, notwithstanding this change, according to Dr. Farrar, pneumonia and dysentery frequently exhibit a paroxysmal and strictly periodic type. Tertian intermittents are also sometimes complicated with fixed pains of the head, breast, back or limbs, so as to personate, with great exactness, a phrensy, pleurisy, hepatitis, or rheumatism—especially if the apyrexias are obscure or imperfect.

West Tennessee.—Near the source of the Yazoo river, and on the northern boundary of the State of Mississippi, the Tennessee river approaches within 125 miles of the Mississippi river; here meeting the high lands of north-western Alabama, it turns almost directly north, and in this direction crosses the State of Tennessee, the western part of Kentucky, and empties into the Ohio river at Paducah, about thirty miles on a straight line from the Mississippi river.

As the water shed of this region is everywhere very near the Tennessee river, much the larger streams of the western district descend westwardly to the Mississippi. Of these the Wolf, the Big Hatchee, Forked Deer and Obion are the principal.

The surface of the whole district, every part of which belongs entirely to the *cretaceous* formation is either level or undulating, "except near the streams, and between their sources, and those of the tributaries of the Tennessee, where it becomes more elevated and hilly."

As a specimen of the level region, we are informed by Dr.

*Fenner Southern Medical Reports, Vol. I, page 345.

Dashiells, of Jackson, that "the portion known as the Forked Deer Valley, and which extends from the counties of Harde-man and McNairy on the east, to the Mississippi on the west, is along the river, low, swampy, heavily timbered, and subject to annual inundation; and on the recession of the water from these low grounds, after one of these spring overflows, numerous ponds are left partially filled with dead vegetable matter, to be carried off through the summer by the slow process of evaporation."* We are also further informed by this writer "that the spring season of this region is exceedingly variable, the summer and fall warm and sultry, and the winter moist and cold—the thermometer frequently indicating a variation of thirty degrees in twelve hours."*

Intermittent and remittent fevers of every grade and variety prevailed throughout the entire district, occurring some autumns, in certain localities, with considerable violence.

Arkansas.—The surface of this State presents great variations in its physical configuration along the Mississippi river which marks its eastern boundary; and from ninety to one hundred miles inland, the country is low and widely interspersed with lakes and swamps, and, with inconsiderable exception, is annually overflowed by the floods of the Mississippi, Arkansas and St. Francis rivers. Further west the surface rises, toward the centre of the State becomes moderately hilly, and still further west rises into the Ozark mountains; beyond these the country spreads out into elevated and gradually rising plains, which terminate only with the Rocky mountains. On the margin of all the rivers the soil deposited by the floods over thousands of acres is a rich alluvion, and very productive; back from these it is very sterile, being, in some parts, either from scarcity of water or metallic impregnation, unfit for cultivation. Of this State the principal forest growths are pine, cypress, sycamore and oak.

Fort Smith.—This south-western station, at an elevation of 460 feet above the level of the Gulf, stands on the south bank of the Arkansas river, at the mouth of the river Poteau; near the western boundary of the State of Missouri, latitude $35^{\circ} 22'$ north, longitude $17^{\circ} 29'$ west.

Its immediate vicinity abounds in *lakes* and *swamps* in every

*Memphis Med. Recorder, March No., 1855, page 358.

direction; upon the subsidence of the water from, and the exposure of the surface of some of the latter, which are annually overflowed, to the action of an intensely hot July and August sun, its garrison sometimes during the fall suffer severely from malarial fever of the *intermittent and remittent* types. In September, 1823, we are informed by Doctor Finlay,* that the prevailing fever assumed a very violent grade of action; the patient being attacked with chilliness, succeeded by fever, and generally pains, most severe in the *head and loins*, with excessive irritability of the stomach, attended in some cases with the vomiting of a black matter, resembling *clotted blood*; red and painful eyes, with a quick soft pulse. After the first 12 or 18 hours, delirium ensued, and the tongue became black, rough and dry; the patient finally expiring, either comatose, or in convulsions.†

“If this was yellow fever, (says the editor of Dr. Drake’s work, and which he appears to think it was,) it must have been *indigenous*, as steamboats in 1823, scarcely ever reached this point, and could not have done so in July and August.”‡

Indian Territory.—This Territory lies directly west of Arkansas, south of Colorado and Kansas, and east and north of Texas. It has been set apart by the government of the United States for the permanent residence of various Indian tribes, removed hither chiefly from the Southern States. It is now principally occupied by the Cherokees, Creeks, Choctaws, Chicasaws, and Seminoles; these tribes have made considerable advance in agriculture, and the industrial arts.§ “The surface in the western part is elevated and rolling; thence it falls gradually to the south-east, where it again becomes broken.|| North of the Witchita and Washita hills, and the hilly region that terminates south of Fort Smith in the Masserne, or Ozark mountains, is a *fine prairie* country, very well adapted to grazing and tillage. Its principal rivers are the Arkansas, and Red, and their tributaries. *Tahlequah*, the capital of the Cherokees, lies a little to the south-east of Fort Gibson.

Fort Gibson.—This post is situated, measuring from a point near the mouth of the Sabine river, about four hundred and

*Medical Statistics, page 229.

†Drake, vol. II., page 286.

‡Ibid, vol. II., page 286.

§Monteith and McNally’s Geog., series No. 5, 1868, page 47.

||Mitchell’s Geog., pages 179-80

twenty-five miles north of the Gulf of Mexico, "on the east bank of the Neosho or Grand river, and about forty miles west of the western line of the State of Arkansas, in latitude $35^{\circ} 47'$ north, longitude 18° west. The site of the fort is about one hundred yards from the bank of the Neosho, and three from its mouth. About a mile and a half to the south-west, toward the Arkansas river, is a lake surrounded by marshes, and as its level varies little from that of the fort, the drainage of the latter is consequently very defective. As the fort was originally located in a cane-brake, the soil partakes, in a very high degree, of what is designated in the language of the country, "river bottom land." It is skirted on three sides by an elevated prairie, about four miles in extent, environed by a chain of hills. The opposite side of the river presents a cane-brake, extending a mile above and below the fort, interspersed with lakes and marshes toward the south-west. The soil is of a character admitting of the most prolific cultivation. Indian corn is the staple commodity; and of mineral productions, the principal are coal and salt.

As regards thermometrical observations, it is found that the mercury rises higher at this point, than at any other in the United States, with the exception perhaps of Fort Yuma, in Southern California. The mean annual quantity of rain, based on three years' observations, is 30.64 inches; and the prevailing winds, which are southerly from the Gulf of Mexico, traverse the marshes and lakes above described.

"It thus appears that all the circumstances most conducive to the evolution of malaria are present; the soil is alluvion; solar heat is of the most intense character, and the quantity of rain, although adequate to the maintenance of a certain degree of moisture, is not sufficient to overflow the low lands during the summer season."*

As the result, perhaps, of a general malarial impress, we are informed by Surgeons Pitcher and Wharton, that cases of pleurisy, cholera morbus, dysentery, diarrhoea and rheumatism occurring at this post frequently assume a strictly periodical character, from which, together with their subjection to the same remedies that are found to arrest the course of intermit-

*Ferry, on the Climate of the United States, page 184.

tent fevers, their close alliance, if not common origin, is inferred.

As regards the prevalence of intermittent and remittent fevers, according to the Army Medical returns, this is one of the most unhealthy posts permanently occupied.

In the vicinity of this post, there prevails among the Cherokee and Creek Indians, during the winter and spring, a *fever*, in which the local lesion is either in the *brain or lungs*, most generally the latter. *This variety of fever*, we are informed by Dr. Coolidge,* he treated very successfully as *Pneumonia*, during the winter and spring of 1845-7, even when there was extensive inflammation of both lungs present, by moderate bleeding, external irritants, mercurial cathartics, and quinine in sufficient doses, *ten or twenty grains, to check the fever*, which it always did.

Florida.—This State lies entirely upon the Atlantic plain, and is generally, by geographical writers, divided into east, west and middle Florida. Although the natural lines, if they exist at all, separating these divisions in some places are so indistinctly marked upon the maps, as to be scarcely noticeable, we hope they will not be entirely lost sight of in the study of the following topographical sketch: South of the *twenty-eighth* degree of north latitude, the surface of the country rises but very little above the water line, or dead level; and, with the exception of a belt extending around the coast, consists almost entirely of an endless succession of *savannas, swamps* and small lakes; known as the "*Everglades.*" To the north and north-west of this low alluvial tract up to the Georgia and Alabama lines, the surface of the country, although more elevated, and in some places somewhat undulating, nowhere rises higher than two hundred feet above the level of the ocean. The whole of this north-western region, consists principally of an extensive *pine forest*, interspersed with *prairies, hummocks* and *swamps*. The prairies are sometimes pretty extensive, stretching miles in length and breadth, and forming most excellent natural pastures. The soil of the swamps along the rivers is *alluvial*, and they are generally covered with a heavy growth of timber, those in the pine barrens, with cypress and cypress knees. The *hummocks* are rich bottoms with a clay soil mixed with sand—these hummock lands are scattered throughout the State, and

*Medical Statistics, U. S. A., pages 169-70.

vary in extent from a few acres to thousands, and when cleared are very productive. Their forest growth consists of pine, dogwood, persimmon, magnolia, cypress, hickory, pride of China, and the different varieties of oak, of which the live oak is the most abundant and valuable; in addition to these are found in some places on the *Peninsula*, maple, hawthorn, mangrove, palmetto, cabbage-palm, magnolia, grandiflora, oleander, *lignum vitæ*, mahogany, crab and satin wood. Besides an almost endless variety of flowers and flowering shrubs, in some localities the different varieties of cactus and maguey (or *Agave Americana*) are met with. The surface of the country from near Tampa Bay, to within twenty miles of the Kissimee river, although low and interspersed with marshes, some of which are *dry* during the winter season, is rather more elevated than it is from the latter point across to Indian river. The banks of all the different streams of this portion of the *Peninsula*, are skirted with a thick and luxuriant growth of *trees, bushes, vines* and *mosses*. *Geologically*, the State is composed of the *tertiary* and *cretaceous* formations, resting upon a substrata of "*rotten limestone*," the peculiar stratified structure of which is probably the cause of the occasional sudden disappearance of small streams and lakes, and of the numerous cavities scattered over the country called *sinks*. The low ridge or water shed, which divides the streams on the east, from those on the west, descends south from the Georgia line, and disappears a little to the north-east of Fort Brook, at lake *Tohopkalika*. The principal rivers of the *Peninsula*, and north-eastern part of the State, are the Pea, Kissimee, Indian, St. John's, St. Mary's, Suwanee and Withlacoochee. Those on the west are the Apalachicola, formed by the union of the Chattahoochee and Flint, rivers of Georgia, and the Choctawhatchie and Escambia, continuations of the Pea and Conecuh, rivers of Alabama. For the want of proper materials, we are unable to give a description of any of the many beautiful lakes scattered over the State. The margins of those upon the *Peninsula*, are generally marshy and overgrown with grass, cypress, the cabbage palmetto, and a thick tangled undergrowth of bushes, vines and mosses. The water of lake Okechobee, is reported by Dr. Babcock* to be during

*Medical Statistics, U. S. A., page 158.

the months of May and June, almost *putrid* in *smell* and *taste*, and rather unhealthy.

Bay of Key Biscayno.—This beautiful sheet of water is situated on the south-east coast of the Peninsula, and is from “Cape Florida to its head about twenty-five miles long, with an average width of two and a half miles, although it contains numerous shoals, there is always in the channel from five to eight feet depth of water.”* The Miami river, a tributary of this Bay, originates in the *Everglades*, four or five miles to the west of its confluence, where it is about one hundred yards in width, with an average depth, at high tide, of about six feet. The surface of the whole country, extending from the *Everglades* to the shores of Key Biscayno Bay, is subject, during the rainy season, to inundation. The soil of the hummocks and prairies of this region consists of *rotten limestone*, mixed with vegetable materials, and on account of their fertility and the mildness of the winter climate of this portion of the Peninsula, are better adapted to the cultivation of sugar-cane, and sea island cotton, than any other section of the State.

Besides the agricultural staples of cotton, rice, sugar, indigo, tobacco and maize, in common with nearly all of our southern borders, but more particularly on the Peninsula, are grown the fig, date, orange, lemon, citron, pomgranate, banana, olive, tamarind, papaw, guava, cocoanut, and alligator pear; in addition to these tropical fruits, also grow the Palma Christa, butter bean and arrow-root.

South of the main land a chain of small, rocky islands, known as the Florida Keys, extend to the northward, ending in a cluster of rocks and sand banks called the *Tortugas*. Of these there is but one, in a medical point of view, that we consider worth notice, and that is *Key West*, or *Thompson's Island*. This Island, the most southern settlement of the United States, lies about sixty miles south-west of Cape Sable, and between eighty and ninety miles north of the city of Havana, and contained, in 1854, about three thousand inhabitants. It is from seven to eight miles long, with an average breadth of about two miles. As regards its general surface, it is low and level, the south-eastern shore presenting the most elevated point. This ridge,

*Medical Statistics, U. S. A., p. 149.

consisting chiefly of sand and shells thrown up by the sea, rises about five feet above high water mark. In the interior of the island are found many marshes and lagoons, some of which are lower than the surface of the surrounding ocean. These marshy low-lands, with a layer of soil sufficient to support vegetable growth, and shaded by small trees and shrubs, are covered, in some parts, during the rainy season, with fresh water.

Land and Sea-breeze.—Between eight and nine o'clock in the morning, the sea-breeze sets in, and blows until between seven and eight o'clock in the evening, when the two currents being in *equilibrium*, a calm occurs; shortly after this time, the land breeze commences, and continues until the commencement of the calm, next morning. The sea-breeze on the coast, says Dr. Southgate,* springing fresh from the bosom of the ocean, is mingled with no deleterious agent, and by communicating a refreshing element to the atmosphere, exerts a benign influence upon the system, during its subjection to elevated and protracted atmospheric heat. In the interior, says Dr. Letherman,† where the invigorating effects of the sea breeze are not felt, the *warmth* and *moisture*, during the summer, produce upon exertion a sense of exhaustion, greater or less, in proportion to the amount of exercise taken, which sometimes requires *remedies* for its removal.

Rainy Season.—From the commencement of the rainy season, which occurs in the latter part of May, or the first part of June, and terminates sometime in September, rain falls in gentle showers almost every day, sometimes so abundantly as to flood the country, and render portions of it almost impassable. During this season violent storms, accompanied with *thunder* and *lightning*, frequently occur.

The mean annual temperature of the State may be stated at about 72°, that of the summer at 82°, and of the winter at about 67°. The mean summer temperature is perhaps a little higher in the interior than it is on the coast, and in the winter, a few degrees higher on the coast, than in the interior.

Key West Barracks.—This military station, which was at one period the principal naval station of the United States for the

*Medical Statistics, U. S. A., p. 333.

†Medical Statistics, U. S. A., p. 331.

Gulf of Mexico, stands on the north-west end of Thompson's Island, in latitude $24^{\circ} 33'$ north, longitude $4^{\circ} 52'$ west. Notwithstanding the garrison, in April, 1833, in consequence of sickness, had to evacuate this post and occupy temporarily that of Fort Clinch, we are informed by Dr. Forry, that he was unable on account of the defectiveness of the Army Medical returns, to determine the precise character of the prevailing diseases, but concludes very erroneously, as subsequent experience has shown, that *fevers of malarial origin*, were not very prevalent.* Yellow fever prevailed here as an epidemic in 1824, and also again in 1854. During the latter year, we are informed by Assistant Surgeon Simpson, that the fever first made its appearance near the centre of the town, in the immediate vicinity of a large pond, which had been the receptacle for quantities of filth and decayed vegetable matter; and that radiating from this point, it gradually spread over the whole island, attacking indiscriminately *both whites and blacks*; he expresses the opinion that it was of local origin.†

Fort Brooks.—This Fort stands at the head of Tampa Bay, on the east bank of the estuary of Hillsboro' river, latitude $27^{\circ} 57'$ north, longitude $5^{\circ} 15'$ west. The river at its mouth although very much contracted a few miles above, is said by Dr. Drake to be one hundred and thirty yards wide, and entirely free from *alluvial deposits*.‡ “The general hospital established here at the commencement of the Seminole war, is situated on an elevated piece of ground in the immediate vicinity of the river, is handsomely encircled by a small grove of live oak trees, which not only add to its beauty, but at the same time afford a cool, refreshing shade to the invalid. The general aspect of the country is low and level. *The drainage is good.* This Fort, says Dr. Forry,§ has always been regarded as a delightful station, and highly *salubrious*, in which tropical fruits, such as the lemon, orange and fig, flourish luxuriantly, whilst the moss-covered live oaks, and Pride of China, add beauty and variety to its scenery. When the *wind* blows from the interior of the country, after it has been flooded, and dried under the influence of a *tropicoid sun*, *severe forms of intermittent and remittent*

*Forry, Climate United States, p. 217. †Medical Statistics, p. 323.

‡Drake, vol. I., p. 49. §Climate United States, pages 46-253.

fever sometimes prevail. As far as we have been able to learn it has suffered twice from *yellow fever*, once in September, 1849, and again in 1853.*

Fort Dallas.—This Fort stands on a bluff, at an elevation of about fifteen feet above low tide, on the north bank of the *Miami* river, immediately at its junction with *Key Biscayno Bay*, latitude $25^{\circ} 55'$ north, longitude 3° west. There are no ponds or stagnant water nearer this fort than the *Everglades*, four or five miles northwest. The soil consists of a loose sand, mixed in places with an alluvial deposit. The formation is a porous rotten limestone, which in many places appears above the surface. Water is found by digging at the depth of fifteen or twenty feet, in abundance, but slightly impregnated with lime. In its vicinity there are also many banks of large and small shells. The soil of the adjoining pine barrens, consists of silicious sand, mixed with vegetable, and other matter. The *hummocks* are the most productive of any others of the coast. Drs. Adkins and Simpson,† from whose reports the foregoing medicotopographical account is compiled, informs us that *frost* rarely ever visits this locality, and that the temperature is remarkably uniform, never exceeding a mean monthly variation throughout the year of over 16° , in fact that *Spring eternal reigns*, and *fruits, flowers and vegetables* are always present. It is very little subject to *intermittent* or *remittent fever*, and is regarded by Dr. Simpson as one of the most healthy military stations in the State.

Fort King.—This interior military station, for a long time the *Seminole* agency, stands at an elevation of about fifty feet above the level of the Gulf, on the dividing ridge that separates the waters on the east from those that flow into the Gulf on the west; latitude $29^{\circ} 10'$ north, longitude $5^{\circ} 12'$ west. With a mean annual temperature of $71^{\circ} 48'$ and mean summer temperature of upward of 80° , and surrounded by extensive marshy low lands, swamps, and stagnant pools, containing organic materials in abundance, it has always been subject to *fever and ague*. During the fall of 1837, we are informed by Dr. Forry, "from the exposure to the action of the *sun*, of the surface of a neighboring hummock, by the removal of its small trees and

*Medical Statistics, U. S. A., page 330.

†Medical Statistics, U. S. A., pages 149-50 and 332.

undergrowth, to guard against Indian ambuscade, its garrison suffered severely with a high ratio and grade of intermittent and remittent fevers.”*

Endemic febrile influences.—As regards these, we are informed by Dr. Southgate, that of the one thousand emigrants landed in East Florida, during the summer of 1767, under the care of their prudent conductor, Dr. Turnbull, one-fourth of them died of *fever* within a very short time after their arrival,—hence he concludes, (and in which opinion we fully concur,) that it is a weak *enthusiasm* to contend that Florida, with her moist atmosphere, her fertile swamps and hummocks, filled with decomposing organic materials, under the influence of a *tropicoid sun*, is the healthiest country in the world. That there are localities, even small districts, around her generally salubrious coasts, in which during some falls, almost entire immunity from *febrile* disorders are enjoyed, is doubtless true, whilst it is equally as true, there are others in which *intermittent and remittent fevers* of every *grade and type*, annually prevail to a considerable extent.

Louisiana.—The surface of this State is low and generally level, with some hilly ranges of little elevation in the western part, and with numerous basins or depressions. The great delta of the Mississippi, included within the Atchafalaya and Iberville, and amounting to one-fourth part of the area of the State, is seldom elevated more than ten feet above the sea, and is annually inundated by the spring floods. A great part of the delta is composed of sea-marsh, which also forms the whole southern coast to the Sabine, and which, through its whole extent, is subject to inundation by the high tides. To the north of this marsh spreads out the vast level of the prairies, which is but little elevated above the former district. The western margin of the Mississippi is also a low country, intersected with numerous small rivers, and liable to inundation. To the west and north of these is an extensive region considerably broken, but nowhere exceeding two hundred feet in elevation. It consists mostly of pine barrens, interspersed with elms, cypress and honey-locust. The tract east of the Mississippi and north of the Iberville and the connected lakes, closely re-

*Climate of the United States, page 212.

sembles the last in surface and forest growths. It is in fact, a part of the same upland plain, whose margin on the western side is separated from the river bed by the low inundated lands, but on the east comes up to the channel of the river, in many places forming those prominent bluffs, on which stand Baton Rouge, St. Francisville, Fort Adams, Natchez and Vicksburg.

To conclude the foregoing geographical account, and present a full topographical outline of the States of Mississippi, Arkansas and Louisiana, we will now have to devote a separate section or two to a description of the Concordia, Yazoo and St. Francis bottoms.

The first of these, commencing at the mouth of Red river, under the thirty-first degree of north latitude, and extending up entirely between the Mississippi and the cretaceous piny-woods plain on the west, with its greatest breadth, where it is traversed by the Arkansas and White rivers, terminates at the high lands in the rear of the town of Helena, Arkansas. This bottom being traversed by the Ouchita and Tensas rivers, has scattered over its surface the beautiful lakes of Villemots, Providence, St. Joseph, Concordia, Lovelace and Catahoola, together with innumerable lagoons and extensive swamps.

Of this bottom the plantations along the Mississippi, the larger bayous and its numerous lakes, constitute, as yet, nearly all of its redeemed and habitable land. Near Helena, and between the mouths of the White and St. Francis rivers, where the Concordia bottom ends, commences the St. Francis bottom, which, after extending up the west side of the Mississippi to a little above the thirty-seventh parallel, terminates at the low hills about thirty miles above the mouth of the Ohio. This bottom, a greater portion of which is a forest of cotton-wood and canebrakes, like the one just described, also abounds in small lakes, lagoons and extensive swamps.

Returning now to a little below the thirty-second degree of north latitude, and crossing over to the east side of the Mississippi river, we strike the lower end of the Yazoo bottom, which commences where the bluffs begin to recede from the river just above Vicksburg, and terminates where they return to it a short distance below Memphis. The only river of this bottom is the Yazoo, which, after its formation in Carroll county, Mississippi, by the Tallahatchee and Yallahusha rivers, flows in a

south-westerly direction into the Mississippi. Besides the Sun Flower, many smaller bayous flow off through the interior of the bottom, from lakes Washington, Swan, Bolivar, Horseshoe and Horn.

This great alluvial region, extending from the mouth of Red river to the upper end of the St. Francis bottom, a distance of more than four hundred miles, with its greatest breadth (about ninety miles) opposite the mouth of the Arkansas, and supposed to contain more than twenty thousand square miles, is, notwithstanding the levees constructed for its protection, during the March and June freshets of the Mississippi and its tributaries, with few exceptions, annually submerged. On the subsidence of the water after one of these spring overflows, from topographical peculiarities, there still remains a large amount to be carried off by *percolation* and *evaporation*. Under these influences, although the surface in many places, before the first of September, becomes dry and cracked, there still remains enough of water in the streams and innumerable lakes to give, through the process of evaporation, to the air of the surrounding country, a considerable degree of dampness.

As might be expected, the inhabitants of these bottoms and their few villages, together with the towns and cities on their borders, or within their influence, are subject to *malarial fever of every variety and grade*.

New Orleans.—This city stands in a large bend on the east bank of the Mississippi river, about ninety miles in a direct line from its mouth, in latitude $29^{\circ} 57'$ north, longitude $13^{\circ} 9'$ west. Its boundary in front extends along the river about five miles. In the rear, the corporation extends to Lake Pontchartrain, though the habitations at present only reach in this direction about two miles. The southern front of the low alluvial surface upon which the city stands is considerably below the annual elevation of the river, with its northern portion below the occasional rising of the lake. On account of this geographical peculiarity, the city has to be protected from inundation (and which, we believe, has been effectually accomplished,) by the erection of strong and extensive levees.

“The intermediate space between Lake Pontchartrain and the city is a cypress swamp, presenting about midway a considerable elevation called the *Metairie Ridge*. This vast swamp has under-

gone a wonderful amelioration within the last twenty-five or thirty years; the part within two miles of the city has been thoroughly drained, by which means, a large extent of valuable land has been reclaimed, and which, in a few years, will be covered with buildings and gardens. The surface is gradually becoming more elevated; the streets are annually extended in this direction; and thus the spot which a few years ago was a *pestiferous fen*, will, probably soon become the abode of a dense and active population.”*

On account of a counter current, or rather eddy, which exists in the Mississippi River, from some point in the third, to a point in the second District, there is continually depositing along its bank, in front of the city, an alluvial formation, which has received the name of *batture*. The streets along the river adjacent to, and in front of this *batture*, are compactly built up, and from the dwelling houses, taverns, drinking houses, warehouses, market houses, oyster sheds, sugar wharves and cotton presses, vast quantities of filth and organic materials, find their way to the water's edge, and are deposited on this sub-aqueous *formation*.

On the subsidence of the river from July to November, this margin extending along the river for more than three miles filled with all kinds of organic *recrements*, accumulated from the city, the shipping and water of the Mississippi, and exposed to the action of a July tropicoid sun, must and does, as a matter of course, emit gases more or less deleterious to health.†

Besides these supposed sources of fever, we are informed by Dr. Fenner that there are also within the corporation a considerable number of vacant lots, the surface of many of which are lower than the level of the streets, and contain during wet weather, stagnant water; stagnant water is also found under many of the houses.‡

* * * * *

From the foregoing medico-topographical description, together with its decidedly southern latitude, the inhabitants of this city are, as a matter of course, subject to every grade and variety of malarial fever; those residing adjacent to, or within the swamp, being, we are informed by Dr. Drake,§ less liable to yellow

* Fenner's Southern Medical Reports, vol. 1, p. 17.

† See Drake, vol. 1, p. 102.

‡ Fenner's Southern Medical Reports, vol. 1, page 53.

§ Principal Diseases, valley of North America. vol. 1, p. 103.

fever, and more to intermittents and remittents, than those residing on the opposite or river side. Upon this subject Dr. LaRoche remarks,* that while *intermittent and remittent fevers* are ascribable to the decomposition of herbaceous matter, the ordinary component of *marshes and paludal localities*; yellow fever, properly so-called, is probably due to the influence of *ligneous* decomposition; an assertion evidently based on an unnecessary refining, and constituting clearly if possible a *distinction without a difference*.

Fort Livingston.—The island of *Grand Terre*, upon which this fort stands, lies at the junction of Barataria Bay with the Gulf of Mexico. The surface of the island rises about two feet above the highest tides of the Gulf, and consists of a dark sand covered with grass and over-shadowed will small live oaks.

From the middle of May, to the middle of August, although there occur tolerably well marked *land and sea breezes*†, from the small size of the *island*, together with, perhaps, the near approximation during this season of the year of the temperature of its air to that of the Gulf‡, the former often entirely fails, whilst the latter not unfrequently continue through the night. For the remainder of the year the *winds* are variable.

Captain Barnard, who had been stationed four years on this island, informed Dr. Drake, that although the mean population during this period had been about fifty, that he was unable to recollect of the occurrence amongst them of a single case of either *intermittent or remittent fever*; and that the same was true as regarded yellow fever, notwithstanding the usual intercourse had been kept up with New Orleans, when the fever was epidemic there.

Fort Pike.—The island of *Petites Coquilles*, upon the northern margin of which stands this fort, seems to have been originally formed of a congeries of small shells, with an admixture of argillaceous deposits brought down by Pearl river. It lies thirty-five miles northeast of New Orleans, and between Lakes Pontchartrain and Borgne, exhibiting an area of seven by

* LaRoche on yellow fever, vol. 11, p. 618.

† Drake, vol. 1, page 86.

‡ Clark on climate, page 152.

twelve miles, with an elevation over the Gulf of not more than two feet. Although it is intersected by numerous bayous of salt water, their bottoms never become a source of malaria, as they are under the influence of the tides, and, consequently, are never exposed to the action of the sun. The prevailing winds during the summer are from the Gulf of Mexico, and its soil is said to be fertile.

According to the Army Medical Returns, this post has remained constantly exempt from yellow fever, the average ratio of intermittents being nineteen, and that of remittents seven per cent.

The fact that Key West, lying at as great a distance from the main land as Fort Pike, and surrounded by salt water and marshes, has been scourged with yellow fever, inclines us to the opinion that the cause of the remarkable salubrity of this post, compared with Fort Wood, about twelve miles to the north-east, surrounded by marshy low-lands, and under the influence of the immense swamps that skirt the Mississippi, is more the result of the want of a sufficient quantity of organic material undergoing decomposition, than it is, as some have supposed, encompassed with salt water.

Upon the subject of whether *saline vapor* exerts upon topographical condition, any influence whatever, in either the production or prevalence of malarial fever, we are informed by Dr. Drake, that in the manufacture of salt at *Syracuse* and *Salina*, New York, the escape of a large amount of *vapor* into the surrounding atmosphere, containing a *minute* quantity of salt, had not *diminished* the prevalence of *intermittent* or *remittent* fever in *either* of these *localities*; and that particularly on the western and southern edge of the former, where the water is evaporated on quite an extensive scale, from wooden pans, entirely by *solar* heat, *intermittent fever* was very prevalent. While here, Dr. Drake was assured by Drs. Hoyt, Daniels, and Lovejoy, that the *venous* blood of the salt boilers was nearly as *florid* as that of the *arteries*, and their complexion *ruddier* than that of the surrounding *population*.

Texas.—This State, like the Carolinas and Georgia, is naturally divided into three regions; the *level*, the *undulating*, and the *hilly* or *mountainous*. The *level* region occupies the entire

coast, extending from thirty to eighty miles into the interior. "The whole Gulf-margin of this region, from the Sabine to the Rio Grande, except along the rivers, consists of a belt of prairie from eight to ten miles in width, which although *low* and entirely *level*, is almost free from marshes."* That part of this region which extends some seventy or eighty miles from the coast, between the Sabine and the San Jacinto and the Guadalupe, is sufficiently elevated for almost perfect drainage after rains, and is pretty free from ponds and swamps. "The bottom lands of the Brazos, the San Bernard and the Colorado are from three to twenty miles in width and heavier timbered, presenting in some places canebreaks of immense extent."* The remainder of this region extending from the Guadalupe to the Rio Grande, is narrower from the San Antonio to the Nueces than those first described; and with the exception of the portion bordering on or within the valley of the *lower Rio Grande*, is more elevated and free from swamps and ponds. Throughout this entire region water can generally be obtained by digging, at the depth of from twenty to twenty-five feet below the surface; but on account of its holding in solution mineral ingredients and a large amount of organic vegetable remains, it is considered unhealthy, producing diseases of the stomach and bowels; near the coast it is frequently quite brackish. The river bottoms and alluvial lands generally, of this region are admirably adapted to the cultivation of cotton, rice and sugar cane. Whilst in the counties bordering on the coast the pine-apple, the olive, the lime, the lemon and the orange all grow luxuriantly.

The *undulating region* extends from the level, and embraces the whole of the interior and north, up to the hilly and mountainous tract. From near the mouth of the Rio Pecos to below Ringgold Barracks, on the Rio Grande, to the Nueces, is a *hot* and rather *desert* region, indifferently supplied with water. From the Nueces to the San Jacinto the face of the country is gently undulating and diversified with prairie and forest; and east of the San Jacinto, is tolerably well supplied with water.

The eastern section of this region, on the head waters of the San Jacinto, and between the Trinity and the Sabine, up to the Red River on the north, never rises higher than into elevated

*Drake Prin. Dis. Int. Val. N. America Vd. 1st, p. 157.

ridges and although occasionally interspersed with prairies of greater or less extent, is nevertheless very well timbered with pine, oak, hickory, pecan, cedar, cypress and other forest trees, and almost everywhere out of the prairies, abundantly supplied with water.

The *elevated, hilly or mountainous regions*, lie generally from one to two hundred miles north of the level region. Between the Brazos and the Colorado rivers, the face of the country first begins to present a broken, hilly appearance; westward of the latter river, on the San Saba, and north of the San Antonio, the country is traversed in various directions, most generally from north to south, by outliers from the Rocky Mountains; none of which, however, rise to any very considerable height; these mountain ranges continue to the west, in broken and irregular chains, until they reach the eastern border of the "Llano Estacado," where, losing their irregularity, they end in a gradual slope to the Rio Pecos and the Rio Grande. The mountains of the San Saba, which are the highest, are in many places thickly covered with dwarf oaks, cedars, bushes and briars. North of this mountainous region the great plain or table land, upon which they stand, with an elevation of from eighteen hundred to two thousand feet above the level of the Gulf, continues in a north-easterly direction to Red River. The height at different points a little west of the eastern declivity of this hilly region, as given by Lieut. Pope, from actual measurement, is six miles south of Preston, on Red River, 1200 feet; at the upper cross timbers 1792 feet; on the south fork of the Trinity 1524 feet; and between the Brazos and Colorado 4237 feet; on the extreme head waters and east of the hilly region just described, the country again becomes level, and in a series of prairies stretching to the north and north-west, beyond Red and Arkansas rivers; finally terminates at the foot of the Rocky Mountains. Beyond the western frontier settlements, from the Rio Grande to the parallel of 36° 30' north, embracing the counties of El Paso and Presideo, and the territories extending north up into, and embracing the *Pan Handle*, with New Mexico on the west, and the Indian Territory on the north-east, is mostly an unexplored country, and with the exception of the settlements, *chiefly Mexican*, near El Paso, contains but very few inhabitants. This whole region is said to be a good stock range, but with a scar-

city of stock water, and though some of the soil is excellent, the droughts render it unfit for agriculture, except by *irrigation*. This region is reported to possess many valuable minerals.*

The whole of this State, the Indian Territory, and western part of Arkansas, are subject to what are commonly called *Northers*—these violent, cold, north winds, frequently accompanied with rain, and which continue from three to six or eight days, although occasionally occurring throughout the year, most generally commence in *October or November*, and end in *March*.

Rivers.—The principal rivers, beginning in the south-west with the Rio Grande, and ending in the east with the Sabine, are the Nueces, San Antonio, Guadeloupe, Colorado, Brazos, San Jacinto, Trinity and Neches. The longest of these, with the exception of the Rio Grande, are the Colorado and Brazos. The first of these originates in or near a salt pond, a little west of Mount Row, and southwest of Mount St. Clara, latitude $32^{\circ} 40'$ north, longitude $25^{\circ} 10'$ west. The main or salt fork of the other, near the eastern line of Mount Cooper, latitude 33° north, longitude $24^{\circ} 20'$ west. These rivers are limited to the north by the water shed between them and Red River, the others arise near the Gulf, into the numerous shallow bays and sounds of which they all discharge their waters. The double mountain and the catfish forks of the Brazos and the main or north fork of the Colorado, long before they reach the extreme western settlements, run through a great salt plain, which at certain seasons of the year, gives to their upper waters a decidedly brackish taste.

Towns and Cities.—Galveston, the principal city and chief emporium of the State, stands on the east end of Galveston Island, latitude $29^{\circ} 18'$ north, longitude $16^{\circ} 46'$ west. Houston, the late seat of government, at the head of navigation on Buffalo Bayou, a small tributary of Galveston Bay; Austin, the present capital, is situated on the north bank of the Colorado River; Matagorda and San Antonio are also important places. The latter as the Head Quarters of the Military Department of Texas.

Fort Worth.—This southwestern Fort is situated about five miles north of the lower cross timbers, upon the south side of the Trinity River, just below the mouth of its clear fork, latitude

* Richardson's Texas Almanac for 1869, p. 92.

32° 40' north, longitude 20° 25' west. These two streams at their junction form an extensive heavily timbered bottom, which during the spring rains is overflowed by the river, which on subsiding leaves its surface filled with vegetable materials, exposed to the action of a *very hot sun*. This bottom extends first from west to north, thence to the east of the fort, which with a southern exposure, at an elevation of one hundred and fifty feet above the bed of the river, stands immediately upon the northern extremity of an extensive elevated prairie; to its southwest, at no great distance, lies Sycamore creek, a tributary of the Trinity. The general surface of the surrounding country, with the exception, of the strip of timber above mentioned, consists of high, rolling prairies, alternating with rich bottom lands, along the water courses. The soil of the prairies is argillo-arenaceous; that of the bottoms a sandy alluvium. The fort meteorological register shows the mean temperature for July and August for three years, to have been 81° and 82° 57' respectively; and for the months of December and January, for the same period 43° 38' and 43° 58' respectively, with a mean for the spring and summer of 23.30 inches of rain.

The climate of this fort is extremely variable, the summers being extremely hot, and the winters, though generally mild, subject to extreme changes of sudden cold. The south and south-east winds, during the hot dry months of July and August, in passing over the heated surface of the surrounding prairies, sometimes have their temperature raised to upwards of 100° Fahrenheit.

Occasionally, the wind changes to the north and north east and blows from the river bottom or swamps—this change is always followed by an increase of *periodic fever*. According to the army medical returns from this fort, *intermittent and remittent fevers* appear to be the prevailing diseases. In some of the cases of intermittent fever observed by Dr. Williams, the cold stage was entirely wanting, a profuse diarrhœa supplying its place, which ceased as soon as the febrile symptoms came on, not unfrequently, however, reappearing again at the time for the next paroxysm. In other cases if neglected, or improperly treated, there was observed a decided tendency to assume a remittent type; with these exceptions there is nothing peculiar mentioned as occurring in either of these varieties of fever.*

Med. Stat. U. S. A., Report of Asst. Surgeon Thos. H. Williams, 1852, p. 373.

Phantom Hill.—This post, at an elevation of 2,300 feet above the level of the Gulf, is situated between the Clear and Elm Forks of the Brazos, about one mile and a half above their junction, latitude $32^{\circ} 30'$ north, longitude $22^{\circ} 45'$ west. Opposite the fort the distance between these two streams is about one mile, their average width being about thirty feet, with a depth of some two or three feet. Its immediate site is in the midst of a grove of scrub oaks of about five acres in extent. A few miles to the west is an almost impenetrable thicket of several miles in extent, of *black jack* and *green briars*. The general character of the surrounding country is prairie; upon the high lands and ridges, the soil is poor and thin; in the bottoms alluvian, composed superficially of sand and red clay. About twenty miles to the south, is a small range of mountains and also a few groves of small timber, mostly post oak and black jack—stunted mesquite trees are thinly scattered over the prairies, and a little timber, principally elm, pecan and hackberry, grows upon the very margin of the streams. The water of the river is brackish, and in warm weather turns very offensive after standing a short time. The mean quantity of rain for the year 1853 was 14.13 inches. It is about 235 miles southwest of Preston on Red River, 60 miles northeast of Fort Chadbourne, and about 200 miles northwest of the city of Austin. As this fort is near the eastern border of the "Llano Estacado," the strong winds and great dryness of its atmosphere, after a rain, causes rapid evaporation, but as there are no ponds or swamps in its vicinity, it has thus far, as regards the prevalence of intermittent and remittent fevers proved almost exempt.*

Fort McKavett.—This fort is situated in the midst of an elevated, hilly region about 2,060 feet above the level of the Gulf, on the San Saba river, about two miles from its source, in latitude $30^{\circ} 55'$, north, and like Phantom Hill, is near the eastern border of the "Llano Estacada." A small stream originates from the base of the river hill, a short distance above the fort and running around between it and the river, expands into a large lagoon, and then discharges its water by a narrow, irregular channel, into the river below. The fort is five hundred yards from, and about one hundred feet above the level of the

* Med. Stat. U. S. A., Asst. Surgeon A. B. Hasson, 1853, p. 375.

river, which flows through several lagoons and bodies of sluggish water, filled with aquatic plants; and lies in a valley about a mile in breadth and which extends some twenty miles above its present source. Geologically, the surrounding country consists of tertiary and cretaceous formations; its surface is frequently intersected with dry ravines, which appear at some former period to have been the beds of water courses; on some of the hills, all of which are very sterile, are a few stunted live and water oaks. The soil of this region, composed of lime, mixed with decomposed vegetable and animal materials, is highly *calcareous*, and only susceptible of cultivation in the valleys and along the water courses, where it is *rich*, and produces abundantly.

The prevailing winds during the hot months, are from the south and southwest, across a *dry, sterile country*. The period of the greatest rain is during the spring months, but to this, however, there are exceptions. The Post Meteorological Register shows the mean annual temperature for 1854, to have been $63^{\circ} 98'$, and for the months of July and August $78^{\circ} 74'$ and $80^{\circ} 10'$ respectively, with a mean annual fall of rain of 16.77 inches.

The climate of this fort is reported by Dr. Crawford to be mild, but subject, particularly during the winter months, to great extremes of temperature, the thermometer frequently indicating a difference of from 30 to 35° in the course of twenty-four hours. The relaxing and depressing effect of the high and long continued temperature experienced at this military station, upon the nervous and muscular systems of those exposed to its influence, strongly predisposes to bilious diseases and visceral engorgements. During this period *malarial fevers*, both *intermittent and remittent*, sometimes of an aggravated type, and in which bilious vomiting and purging are frequently present, prevail.*

Fort Ewell.—This fort, or rather *camp*, is situated on the west bank of the Nueces, at the point where it is crossed by the road from San Antonio to Laredo, in latitude about $28^{\circ} 12'$ north, and longitude 22° west. At this place the river makes a turn partly surrounding an elevated portion of land, which slopes from a height of some twenty-five feet above its ordinary

*Med. Stat. U. S. A., Asst. Surg. W. S. Crawford, 1853, p. 386.

level, to its swampy margin. The soil, which is *argillaceous*, is somewhat softened by the spring rains, but during the remainder of the year is baked to *stony hardness*, and on this account incapable of *cultivation*. A few elms are found growing in the swamp, and its vegetation consists entirely of the different varieties of the cactus and acacia. Nearly surrounding the fort on both sides of the river, and in high water allowing egress only by the road leading to Eagle Pass, is an extensive swamp, partially overflowed at every rise of the river, and at times converted into a lake of many thousand acres; *from this marsh the prevailing winds of summer blow directly on the fort*. The water of the Nueces, particularly during freshets, is often highly charged with organic matters, and, without filtering cannot be otherwise than unhealthy. The Army Meteorological Register shows the mean annual temperature at this post to have been $71^{\circ} 30'$; and for the months of July and August, $84^{\circ} 37'$ and $83^{\circ} 84'$ respectively, with a maximum of 100° , and an annual fall of rain 34.58 inches.

From May, 1852, to March, 1854, nearly two years, the troops were encamped on the low land near the bank of the river, and from which they were more than once driven by its freshets, to return again on the subsidence of the water; here, without flooring for their tent, and subject to strong winds and hurricanes, which not only frequently blew them down, but sometimes actually into *shreds*; without proper food, and often without proper clothing, exposed to the searching "northers" of winter, the *excessive heat of summer and malaria of the surrounding swamps*; they suffered, as a matter of course, greatly from *periodic fever*, and diseases of the *digestive organs*. For the two years anterior to the first of August, 1854, there occurred in a command averaging 170 persons, 627 cases of *periodic fever alone*. The attacks of this fever we are informed by Dr. Head,* from whose report the foregoing medico-topographical history has been compiled, were always ushered in by chills; the convalescence was almost invariably slow, and attended with unusual debility, relapses being frequent and the tendency to recur, at periods of fourteen and 21 days strongly marked. Below and to the east of this military station, down to near Corpus Christi, along

* Med. Stat., U. S. A., p. 389.

the banks of the *Nueces*, are rows of oak and cotton wood trees, richly festooned with heavy mosses. The surface of the country adjoining, and for some distance back from the river, we are informed by Dr. Moses,* consist of a *low arid plain*, in some places covered with grass, mesquite, cactus and clumps of oaks. The heat of this region during the summer is rather *excessive*, the thermometer in the shade, at 3 o'clock in the afternoon ranging from 90° to 102°. Rain falls at Fort Ewell, and perhaps throughout this district every month in the year, but in greatest quantity during the month of May. Storms during the spring and summer, accompanied with *thunder* and *lightning*, frequently occur. The winters are mild; snow very rarely ever falling, and then not to the depth of more than an inch, and soon melting. The mercury sometimes in December or January, under the influence of a norther, has been known to descend as low as 22°, at which time thin sheets of ice were formed. The farmers raise corn, a few sweet potatoes and melons. With the exception of a *large blue grape*, which grows in the river bottoms, particularly in the vicinity of Fort Merrill, there are no other wild fruits. Throughout this region, wherever troops have been stationed, as at Forts Ewell, Merrill, or camp Santa Gertrude, or settlements exist, and there is one of some twenty families opposite Fort Merrill; after the subsidence of the water of the May and June floods in the *Nueces* and its tributaries, and which leaves their recently overflowed bottoms, particularly the lower portions of the former, filled with decomposing organic materials under the influence of a tropicoid summer's sun, *malarial fever prevails extensively*, and at times, in some of these, of rather an aggravated character.

The Rio Grande.—This river, the largest with the exception of the Mississippi, that discharges its waters into the Gulf of Mexico, originates in the Rocky mountains, nearly under the thirty-eighth parallel, and thirtieth meridian. It first descends to the south, then turns to the southeast, and finally empties into the Gulf, nearly under the twenty-sixth parallel, and twentieth meridian. Its lower half constitutes the dividing line, between the United States on the north, and the Mexican

* Med. Stat. U. S. A. Reports, Ast. Surg. Israel Moses, 1854, p. 252.

States of *Tamoulipos*, New Leon, Coahuila and Chihuahua on the south. According to Dr. Drake upon the authority of Dr. Gregg, and upon the reports of some of the United States Army Medical Officers, it is a broad, shallow, rapid stream, made up of an accumulation of mountain torrents, eminently alluvial, and abounding in rapids, sand bars, and snags. Although its banks in many places are not more than ten feet high, its breadth of channel in its upper half is so great that its water scarcely ever rises sufficiently high to overflow them. It has but few tributaries, and in its descent loses so much of its water by *evaporation* and *infiltration*, that its depth rather diminishes than increases with its progress; thus reversing the law that governs the Mississippi. Some of the authors of the few topographical descriptions we have met with of this river, speak of a *lower, middle and upper* Rio Grande. These divisions, however, although not very clearly defined, are generally understood to extend, the first from its confluence to Fort Duncan, or the mouth of the Rio Pecos; the second or middle from the Pecos to El Paso; and the third or upper from El Paso to its source. The average width of the lower portion is from 150 to 200 yards; that of the middle, although but little narrower, from the loss of the Pecos, has much less volume of water, and near El Paso, in long droughts, by *absorption*, almost entirely disappears. Its upper portion is generally from seventy to eighty yards in width and very rapid. Its banks are skirted almost throughout its entire length, with the pecan, the cotton wood, and other forest trees; near Camargo with the mesquite and a stunted species of locust, intermixed with ebony, in other places willows, canes and grass.

From the first of May to the last of July, its volume of water, from the summer rains, and the melting of the snows on the mountains further north is greatly increased; during the annual flood, its water, always more or less turbid, is much more so, and that used for irrigation, always leaves a heavy deposit, which is thought to enrich the land greatly upon which it settles. Besides the substances mechanically suspended in its water it is said to hold in solution, the salts of calcium, sodium, potassium, and magnesium, and to be at times strongly impregnated with sulphuretted hydrogen gas.* Opposite Fort

*Med. Stat., p. 423.

Brown, when the river is low, it is so strongly impregnated with sulphur as to be extremely unpalatable, and on this account alone almost unfit for use.* Its water is reported to be annually drunk by more than sixty thousand persons, and although by some considered entirely healthy, is generally believed, on account, perhaps, of the mineral ingredients, and organic vegetable remains it contains, to produce in an unfiltered state, particularly in those unaccustomed to its use, derangement and diseases of the digestive organs.

Its Tributaries.—Among these on the south may be mentioned the San Juan or Salinos, the Sabinos, and the Conchas, these streams all originate from the eastern spurs of the Mexican Cordilleras, or Sierra Madre Mountains, and, as a matter of course, discharge their waters into the Rio Grande. Upon the waters of the first, the Salinos, are situated the towns of Bueno Vista, Saltillo, and Monterey; upon those of the second or Sabinos, Santa Rosa and Monclova; and upon a small tributary of the third, the city of Chihuahua. Those on the north are the Rio Las Moras, the San Pedro and the Rio Pecos. The first of these, the Rio Las Moras originates, in full volume near Fort Clark, is not more than forty feet wide and flows off south-east to the Rio Grande, without a tributary. Its banks are deeply shaded with live oaks, pecans and elms, which together with many varieties of shrubs and vines make up a dense and luxuriant undergrowth.†

The second, the San Pedro, originates within the table lands of Texas, west of the country of Kimball and descending with a rapid current and bearing almost due south, enters the Rio Grande, about ten minutes west of the twenty-fourth meridian; on its banks are occasional small groves of pecan, live oak and sycamore trees, and in its bottoms an abundance of wild plums and muscadine grapes.‡

The third, the Rio Pecos, arises in the Rocky Mountains, a little east of the city of Santa Fe, after leaving the flanks of the Sierra Blanco, it descends east of the Guadalupe Mountains through the "Llano Estacado," in a south-easterly direction, to its confluence. It is a very muddy, rapid river, with an average width of about sixty feet. Along its banks, which are almost

*Med. Stat., p. 428.

†Ibid., p. 191.

‡Ibid., p. 190.

vertical, are more or less forest trees, and shrubbery, similar to that along the banks of the Rio San Pedro.*

The Valley of the lower Rio Grande extends from the shore of the Gulf to near the mouth of the Rio Pecos. From a little below the twenty-ninth parallel of north latitude, "it presents a general aspect of levelness, with tracts of swamp and some small lakes of salt water. In general its soil is not deep, and in some parts so poor and sandy, that the country is almost a desert. Prairies are common, the forests are thin and composed of stunted trees; the prickly pear invests the surface, and every where good water in the form of springs and streams is wanting."† In this region, which corresponds with the "Tierras Calientes," or hot countries of the Mexicans, are situated Matamoras, Monterey, Meir Camargo and the Presideo del Rio Grande, and Forts Brown, Ringgold Barracks, McIntosh and Duncan. The middle portion of the valley extends from the lower to Fort Bliss. On the north of the Rio Grande from the near approach of some flank ranges of the Sierra Guadalupe, under the names of *Apache Mountains* and *horse head hills*, the valley is very narrow. South of the river it is much wider, and, with the exceptions of the valleys entering the Rio Grande, from this direction is throughout more or less hilly or broken. From the "Bolson de Mapimi" a dry and hot valley some three thousand five hundred feet above the level of the Gulf, northward to the vicinity of the City of Chihuahua, and thence north to the settlements of the El Paso, the country gradually rises to the height of upwards of four thousand feet. Opposite to El Paso (Fort Bliss) the mountains on the east and west close into the river and diminish the head of the valley here to eight or ten miles; these mountain ranges to the north of this point, again diverge to the east and west of the Missilla country, giving to the valley of the upper Rio Grande, particularly on the west as high probably as nearly opposite Sante Fe, considerably greater breadth than it has opposite to, and on the north for some distance below Fort Bliss. The accumulation of heat by radiation from the surface of the elevated valleys and dry sandy plains lying to the south and south-east of El Paso, give

*Med. Stat., p.

†Drake, Vol. 1, p. 153.

to this portion of the valley a mean summer temperature of upwards of 84° , nearly as high as that of the lower Rio Grande.

As there are elevated localities and districts within the Torrid Zone, in which are found the climate and productions of the Temperate Zone; there are also within the latter, districts and localities in which the climate and productions, both *animal* and *vegetable*, resemble very nearly those of the former. Upon this subject, and probably in elucidation to some extent of the character of the climate of a portion of the "*tropicoid*" region of the valley of the Rio Grande; we are informed* that when the almost constant wind of the lower Rio Grande, the *south-west*, changes to the *true south*, it brings from the regions over which it blows a hot, dry atmosphere, which at least during the time of its prevalence, renders its climate more *desert* like than *tropical*.

Fort Brown.—This fort stands on the north bank of the lower Rio Grande, in latitude $25^{\circ} 54'$ north, longitude $20^{\circ} 30'$ west, adjoining the town of Brownsville and opposite the Mexican town of Matamoras. The fort and town are built upon an alluvial soil, at an elevation of two feet above ordinary high water mark, and about fifty feet above the level of the Gulf; and from which it is distant, on a straight line, about twenty miles. The surface of the ground upon which the fort and town are situated, presents slight elevations and depressions just above and adjoining the town there is one of these depressions, there is also another one below the garrison. At high tides in the river, and after heavy rains, these depressions are submerged and the water settles around the town, when this happens, what is called "Washington Square," on the north-west border of the town, is nothing but a pond. Below the fort there is a lagoon, which is connected with the river, by a ditch, at low tides of the river, this communication ceases to exist.

Brownsville contained, in 1853, about 3,500 inhabitants, a majority of whom were Mexicans. Before this time there was no regular system of drainage, and the water after the rains was allowed either to run off as best it could, or remain and be removed by the slow process of "absorption and evaporation."

* U. S. A., Meteorological Register, Report of Louis Blodget, Esq., p. 706.

Since then we understand there has been introduced by the city authorities, a partial system of drainage and paving, with the result of the first as a sanative measure, or to what extent the latter has been carried, we are not informed. The dwellings of some of the white citizens have cisterns, and to them and their friends the rain water is truly a luxury. There has also been recently constructed within the fort, three small cisterns for the use of the garrison.

This Post, Brownsville and Matamoras, together with all the Mexican *ranches* within their immediate vicinity, suffered during the summer and fall of 1852, with intermittent and remittent fever. In 1853, whilst the garrison, Brownsville and Matamoras, suffered with yellow fever, in the latter part of the year, of rather an aggravated character, the neighboring ranches are reported to have entirely escaped.* The first case of this epidemic occurred on the 23d of September, and appears to have been clearly of domestic origin, and the last shortly after the first frost about the 20th of December. The total number of cases treated in the garrison was 254, of which, on account of non-acclimation and other causes, fifty died, nearly one-fifth. Before the commencement of this epidemic, the barometer showed the mean atmospheric pressure for the month of August, to be 30.16 inches, and during its prevalence with slight oscillations, ranging from 29.72 to 30.52, the result probably, of the unusual occurrence of several "northers;" returning again in December, as the disease gradually declined, and finally ceased, to 30.16 inches.

The Army Meteorological Register, for this year, shows the mean monthly temperature for the months of June, July and August, September, October, November and December, to have been respectively $82^{\circ} 06'$, $84^{\circ} 45'$ and $82^{\circ} 76'$ with a maximum in July of 94° , and a mean summer temperature of $83^{\circ} 09'$, and for September, October, November and December, $78^{\circ} 91'$, $76^{\circ} 11'$, $69^{\circ} 37'$ and $62^{\circ} 26'$, with a maximum in September of 89° , and a mean fall temperature of $73^{\circ} 13'$. It also shows for the months of June, July and August, 1.70, none, and 3.10—480 total inches of rain for the summer, and for September, October, November and December, 8.00—7.77—1.30 and 0.65—Total, 17.05 inches for the fall, with an annual fall of 26.80 inches;

* Med. Stat. U. S. A., Report of Surg. S. P. Moore, 1854, p. 353.

four-fifths of which 21.85 fell during the summer and fall. From these data it appears that this epidemic commenced on the 23d of September, under a mean temperature for the months of August and September of $84^{\circ} 81'$ and $80^{\circ} 05'$ (total $82^{\circ} 43'$) with 3.10 and 8.00 (total 11.10) inches of rain; continued through October and November under a temperature $71^{\circ} 11'$, and $69^{\circ} 37'$ (total $80^{\circ} 22'$) and 7.75 and 1.30—total 9.05 inches of rain and ceased to prevail for the want of heat and moisture after the first frost, about the 20th of December.

During the fall of 1858, yellow fever of a very malignant and unmanageable character, again prevailed here. The first case occurred in Brownsville, on the 22d of August, and in the garrison about the 1st of September; it rapidly became epidemic and ceased to prevail about the last of October.

The Army Meteorological Register for this year shows the mean annual temperature to have been $73^{\circ} 63'$ and the mean monthly temperature for the months of June, July and August to have been $82^{\circ} 81'$, $84^{\circ} 64'$ and $84^{\circ} 81'$ respectively, with a mean summer temperature of $84^{\circ} 08'$, with a maximum of 98° , and that for the months of September, October and November respectively, to have been $88^{\circ} 05'$, $77^{\circ} 88'$ and $62^{\circ} 89'$, with a mean autumnal temperature of $73^{\circ} 61'$, and a maximum of 94° . It also shows the mean monthly fall of rain for the months of June, July and August to have been 5.15—0.70—and 2.75 respectively, with a total for the summer of 8.30 inches; and for September, October and November 5.77, 2.75—0.45 respectively, with a total for the fall of 8.97 inches, with a mean annual of 24.36 inches; of which, two-thirds 17.27 inches fell during the summer and fall. Dr. Watson gives for this year the mean summer and autumnal temperatures at $82^{\circ} 45'$ and $80^{\circ} 91'$, with a mean Hygrometer for the first of $75^{\circ} 24'$, and for the latter $75^{\circ} 41'$, with a mean atmospheric pressure throughout the entire period of 30.03 inches. From the foregoing statements and meteorological observations, it appears this epidemic (1858) commenced under an average mean temperature for the months of August and September of $82^{\circ} 43'$, with 2.35 and 5.77, total 8.22 inches of rain; continued through October under a temperature of $77^{\circ} 88'$ and 2.75 inches of rain; and ceased to prevail about the first of November, for the want of heat and moisture, under a mean temperature for October of $62^{\circ} 89'$ and 0.45 inches of rain.

The total number of cases that occurred in the garrison during the prevalence of this epidemic, were ninety-two; of which forty-one died. Of the ninety-two cases, fifty-eight had black vomit, being over sixty-three per cent. Of the fifty-eight cases of black vomit, twenty recovered, being thirty-four and a half per cent. of recoveries. In this epidemic, the change of color before death was very remarkable. Some being perfectly yellow, whilst others were almost black. There were also, frequent sudden congestions of the head, the stomach, bowels and kidneys.* If it is true, as is contended for by Dr. A. P. Merrill and others,† that genuine black vomit in yellow fever never occurs except as the result alone of a high state of inflammation, bordering upon *gangrene of the coats of the stomach, and is always fatal*: then, as a matter of course, Dr. Watson was mistaken in the nature of the matter vomited in the above mentioned twenty cases that recovered; but as it is, we believe, a generally admitted fact that *black vomit* has frequently occurred in cases of *yellow fever* and the patients *recovered*, brings us to the conclusion that he was not mistaken, and that the matters discharged in these cases were true black vomit, and precisely such as occasionally occurs in malarial fever, without either of the above mentioned complications.

Matamoras.—This town stands on the south bank of the Rio Grande; opposite and below it, the river is narrow, muddy, rapid and eddying, resembling very much the Mississippi; the country on each side above and below is level and sandy, with groves of small timbers, and an abundant growth of the prickly pear. Immediately above the town, the river turns to the east and after making a bend of many miles, returns below the town on the south, so near as to be in sight. In this bend there is a small permanent lake or pond, which occasionally in river floods extends its area to the edge of the town. To the west of the town there is a larger lake, about two miles long, which becomes dry in the month of August. To the north and south of this lake, the ground is a little more elevated than that on which the town is built and covered with small trees. Upon the whole, Dr. Drake, from whose work the above topographical de-

* Med. Stat. U. S. A. Report Asst. Surg. A. F. Watson, 1859, p. 182.

† Memphis Medical Recorder, Jan. No., 1854, p. 163.

scription is condensed, concludes there is but little drowned or swampy land in its vicinity, and that it is not liable to yellow fever. From all that we have been able to gather in relation to the prevalence of fevers here, it appears that it has ever since its first settlement been subject to all the varieties and grades of intermittent and remittent fever, and that yellow fever, if not in other years, prevailed here in 1841, 1845 and again in 1853.*

Ringgold Barracks.—This Fort, at an altitude of about 122 feet above the level of the Gulf, stands immediately on the north bank of the Rio Grande, opposite the town of Camargo, in latitude $26^{\circ} 24'$ north, longitude $22^{\circ} 03'$ west. The river opposite the barracks, is two hundred yards wide, exceedingly crooked and impeded by sand bars. The soil of the surrounding country is sandy and miserably poor, covered with cactus, dwarf musquite and a few ebony trees. A few hundred yards immediately north of this post, is Rio Grande City, which in 1854 contained a mixed population, chiefly Mexicans, of nearly six hundred souls. Although the winters are mild, except when a norther blows, this is considered, and probably is, the hottest post on the Rio Grande, the heat being constant for more than nine months of the year and excessively prostrating to the mental and physical faculties.

In 1854, rain fell every month in the year, except April, in greatest quantity in June; swelling the Rio Grande and overflowing its banks, and to a considerable extent the adjoining country on both sides down to its mouth. The mean annual temperature, for this year as shown by the post meteorological register was $73^{\circ} 29'$, and for the months of June, July and August respectively $84^{\circ} 30'$, $82^{\circ} 65'$ and $83^{\circ} 01'$, with a maximum in May of 102° . The winter was very mild, frost having formed but, two or three times. The summer and autumn were unusually hot and dry. During the fall and early winter a malarial fever of unusual severity prevailed, attacking a large majority of the garrison and nearly every soul in the adjoining village. It appeared in every degree from an ordinary fever and ague to a low congestive form of remittent, closely resembling yellow fever. At Camargo, on the Mexican side, four a five miles dis-

* Med. Stat. U, S. A., p. 383.

tant, nearly one third of the population died, and more than thirty in Rio Grande city; along the banks of the Nueces and the Rio Grande, few escaped between Laredo and Brownsville. In the interior at Monterey, Saltillo and Mier, the disease was comparatively mild, whilst at Corpus Christi it was very severe, and attended with *black vomit*. The symptoms detailed by Dr. Moses as present and to some extent characteristic of a majority of the cases of this epidemic, besides a general tendency to congestion, were restlessness, excruciating pain in the head, and limbs, delirium, yellowness of the skin, sometimes approximating a mahogany color, with great irritability of the stomach, attended with vomiting of a *greenish yellow matter*. Convalescence was slow, the lips retaining their exsanguine appearance, and the complexion its *dull muddy yellow hue* for a long time. Relapses were very frequent, chills and fever recurring without regularity, every two, three, seven, fourteen or twenty-one days, especially after the slightest fatigue.*

Fort McIntosh.—This fort stands on the north bank of the Rio Grande at an elevation of about 806 feet above the level of the Gulf, in latitude $27^{\circ} 31'$ north, and longitude $22^{\circ} 21'$ west. The plain upon which it is built has an elevation of about fifty feet above low water mark, and extends back from the river about two miles, where it is interrupted by a range of low hills, running parallel with the same. The soil is of a loose sandy character, containing a small portion of clay, with a depth of from fifteen to thirty feet, resting upon a base of cretaceous lime stone. Owing to the bad character of the soil, the small quantity of rain, and the rapid evaporation, caused by the almost constant prevalence of south-east winds, the flora of its vicinity is very limited; only such plants and trees are found growing here as can best resist the continued action of the above named causes; of the former there is a great variety of the cacti, the most common of which is the prickly pear, and of the latter, the principal one, with the exception of a few scattering willows, ash and mulberry trees, along the river bank, is the mesquite, a *species of the acacia*.

In the soil made by deposits from the river, Indian corn can be raised in small quantities, by *irrigation*, but wheat, rye, oats

* Med. Stat. U. S. Army. Report of Asst. Surg. Israel Moses, 1854, p. 357.

and sugar cane cannot be grown. The seasons here are considered by Dr. Perin, as consisting of but two, *summer* and *winter*.* The former usually commences in *March* and ends in *November*, during which period a high temperature generally prevails, the thermometer ranging between 75° and 107° in the shade; although the mercury has been known during the prevalence of a norther, to descend as low as 17° , the winters are, as a general rule, very mild. Dr. Perin, from whose report the above medico-topographical description is condensed, informs us, that during a period of three years' service at this Post, he never met with a single case of *malarial fever*, that did not have its origin somewhere else, and that the citizens of *Laredo*, in its immediate vicinity, enjoyed a like immunity from malarial diseases.†

Laredo
Fort Duncan.—This fort stands on a dry, elevated plateau on the north bank of the Rio Grande, near Eagle Pass, about fifty feet above the bed of the river, and 1460 feet above the level of the Gulf, in latitude $28^{\circ} 43'$ north, longitude $23^{\circ} 30'$ west. The plain upon which the fort immediately stands, terminates towards the river by a precipitous fall of from twenty to thirty feet, to the level of a lower sandy plain or river bottom of about half a mile in breadth, covered with bushes and grass, and subject at high tides of the river to overflow. The soil around the fort is sandy, covered with fine grass, scattering mesquite trees, and a tangled mass of thorny bushes known as "*chapparel*." It is open to the south and southeast to the summer winds, and protected on the north by a range of hills from the northers. The post meteorological returns, show its mean annual temperature for the year to be $70^{\circ} 55'$ and for the months of June, July and August $82^{\circ} 81'$, $84^{\circ} 67'$ and $85^{\circ} 94'$ respectively; with a mean annual measurement of rain for the same period of 22.20 inches.

From the foregoing medico-topographical description condensed from the reports of Drs. Cooper‡ and Myers§ this post appears to be free from all local causes of disease and the entire

* The division of the seasons adopted in this essay is that of Sir James Clark including under winter the months of December, January and February; under spring, those of March, April and May; under summer those of June, July and August; and under autumn September, October and November. See Clark on Climate p. 66.

† Med. Stat., U. S. A., p. 360.

‡ Med. Stat., U. S. A., p. 364.

§ Med. Stat., U. S. A., p. 179.

exemption of the command stationed here from *malarial fevers*, fully substantiates the supposition that *none exist*; in fact malarial diseases originating elsewhere, are reported to be benefited by a removal to, and residence here.

Fort Bliss.—This fort stands in the immediate river valley, on the north side of the Rio Grande, nearly opposite the town of El Paso, in latitude $31^{\circ} 46'$ north, longitude $29^{\circ} 30'$ west. The valley opens here to the southward, and the neighboring high lands are generally destitute of timber. The post meteorological register for 1850 shows a mean annual temperature of $63^{\circ} 17'$, and for the months of June, July and August, $85^{\circ} 26'$, $86^{\circ} 12'$, and $81^{\circ} 77'$ respectively; with a mean annual measurement of rain of 11.21 inches. "The settlement of the El Paso, extends from the falls of the Rio Grande on the north, to the Presideo on the south, a distance of twenty-two miles, and is a continuous orchard and vineyard, embracing within its ample area an industrious population, chiefly Spanish, unmixed with Indian, of at least eight thousand.* The whole settlement is irrigated by water taken principally from the Rio Grande."

In the valley to the south of the Rio Grande, above and to the north-west of Matamoras and to the south of Fort Bliss, and in which are situated Santa Rosa, Monclova and the City of Chihuahua, the cultivation of sugar-cane, cotton and Indian corn, together with all other agricultural operations, are carried on by *irrigation*. The surplus water used for this purpose is generally allowed to run on the lower lands, and thus create permanent ponds and swamps. There are marshes, says Dr. Drake, upon the authority of Dr. Gregg, which appear to have been produced in this way, below Presideo, more extensive ones about Santa Rosa, and many of considerable size in the vicinity of Monclova. As regards the prevalence, or particular type of the fevers of this region, we know but very little. At the Presideo, the town of Santa Rosa and the City of Monclova, Dr. Gregg, in October, 1846, found the natives suffering with *chills and fever*; but as neither of these localities, or the surrounding country naturally abounded in the conditions, to which, by observation, he had been led to ascribe autumnal fever, he very properly, we think, attributed its prevalence to

* Drake, Principles Dis. Int. Val. North America, Vol. I., p. 155.

malaria, generated under a burning sun, from the decomposing organic material contained in the above mentioned *artificial ponds and swamps*.

Having in the preceding medico-topographical description of the Rio Grande, its tributaries and valley, been necessarily compelled to embrace a portion of the adjoining territory of Mexico, no less on account of topographical similarity than to enable us to show the connection existing between the surface of a country and its endemic fevers, we will now endeavor to reproduce (in relation to the origin and prevalence of malarial fever) some of the principal facts contained in the foregoing medico-topographical histories, and then dismiss this part of the subject. At *Fort Worth*, on the waters of the Trinity, latitude $32^{\circ} 40'$ north, with moisture and vegetable materials in abundance, under a mean summer temperature of upwards of 80° , we find malarial fever of the intermittent and remittent types annually prevailing. At *Phantom Hill*, situated in the midst of the elevated, hilly region on the Brazos, latitude $32^{\circ} 30'$ north, with nearly as high a mean summer temperature, $79^{\circ} 83'$, as that of Fort Worth, with very little moisture, and no ponds or swamps, the fever never prevails. At *Fort Ewell*, on the bank of the Nueces, latitude $28^{\circ} 12'$ north, almost surrounded by swamps, subject to frequent overflows by the river, and under a mean summer temperature of $83^{\circ} 64'$ the fever was very prevalent. They also further show, at the interior stations and localities of Fort Brown, Ringgold Barracks, Matamoras, and in some of the surrounding villages and *ranches*, with a sufficiency of moisture, and organic material, under a mean summer temperature, ranging from 83° to 85° , that *malarial fever of domestic origin*, to the "manor born," of every grade and type, from simple intermittent to the most malignant yellow fever prevails. Whilst at Fort McIntosh, latitude $27^{\circ} 31'$ north, with a sufficiency of water, 18.66 inches of rain annually, two-thirds of which, 12.39 inches, falls during the summer and autumnal months, with a higher summer temperature, $85^{\circ} 91'$, than Fort Brown, *without vegetable materials*, being surrounded by an almost *desert* region, and not subject to overflow by the river, *malarial fever never prevails*. If, then, malarial fever, particularly that type recognized as *yellow fever*, ever originates as the result of certain proportions of moisture, and organic materials,

under a high temperature, over 80° , in localities where it prevails, then after an overflow in the Nueces, or Rio Grande, we ought not to be any more surprised at its origin and prevalence in *cities* and *villages* along these streams, than at its origin in the valley of the Lower Mississippi, at Charleston, in South Carolina, in the West Indies, or on the coast of Guinea, the British Indies, or anywhere else, where the necessary elements of climate are present. That the presence of vegetable materials undergoing decomposition are absolutely necessary for the production of any of the types of malarial fever, we think is very clearly shown in the medico-topographical history of *Fort Duncan*. This post, with as great an amount of moisture, 22.20 inches of rain annually, and nearly as high a mean summer temperature, upwards of 84° , as that of Ringgold Barracks, with but very little, if any, vegetable materials, and not subject to inundations from the river, is so completely exempt from *malarial fever* that those suffering from intermittent and remittent fever, and other malarial diseases, are reported not only to be benefited, but actually cured by a removal to, and residence at this post.

New Mexico.—This Territory is bounded on the south by Texas, and the Mexican States of Chihuahua and Sonora, on the north by the territory of Colorado, on the east by Western Texas and the Indian Territory, and on the west by Arizona; and is naturally divided into three great regions, the eastern, comprehending the Llano Estacado, the middle, the valley of the Rio Grande, and the western, the country beyond the Sierra Madre mountains. Its general surface consists of a succession of mountain ridges and narrow valleys, running nearly from north to south, and which, from the craters of extinct volcanos and beds of scoriæ observed in many places, probably owe their peculiar structure and directions to volcanic action. In many of these mountain ridges are found, more or less, gold, silver, mercury, copper and galena. The silver mines of the Sierra de los Organos, near Fort Fillmore, and in which this metal is found in the form of a sulphuret, united with galena, were in 1853 profitably worked. The whole territory yields a sparse growth of stunted cedars and artemisias, some of the mountain ridges, long leaf pine, small white oaks; whilst along the banks of some of its principal streams, as the Rio Puerco, Rio de Galisteo and

Rio Grande, are occasionally found small groves of cotton-wood. In his geographical atlas, Mr. McNally represents some of the valleys as being very well adapted to grazing, and in which mules, sheep, goats and cattle abound, and others, particularly that of the Rio Grande, as highly productive, yielding fine crops of Indian corn, wheat and other grain; in some portions, peaches, apples and grapes grow luxuriantly. But notwithstanding this favorable account of Mr. McNally, we cannot, from the reports of Drs. Langworthy,* and Hammond,† regard New Mexico, as a whole, in any other light, than a great mountain desert, almost entirely unfit for the residence of man in a state of civilization.

The mean annual quantity of rain, that falls throughout the country, is very small, not averaging, perhaps, more than *twelve inches*, and in the neighborhoods around Forts Fillmore, Conrad, and Socorro, if not others, probably not more than *half this amount*. Throughout its southern portions very little dew falls, and south of Fort Craig, latitude $33^{\circ} 26'$ north, although there occur, during the winter months, slight snows, on account of the great dryness of the atmosphere, they almost immediately melt. From the fact that more than three-fourths of all the rain falls between the 1st of July, and the last of November (the rainy season,) is probably the reason, more than its actual deficiency, that all agricultural operations have to be carried on by means of *irrigation*. The surplus water from the canals, used for this purpose, like that in the Mexican settlements, already mentioned south of Fort Bliss, instead of being properly drained off, is frequently suffered to run on the low lands, and give origin to ponds and swamps. These swamps filled with decomposing vegetable materials under a high temperature, as a matter of course, during the fall months, become prolific sources of *malaria* and *fever*.

In some portions of the territory, about Socorro for instance, where the elevation is nearly six thousand feet above the level, of the Gulf, the electrical tension of the atmosphere, at times, is very great, especially after a fall of rain or snow; the great dryness of the air, the large quantities of salines the earth contains, together with the rapid evaporation on such occasions, sur-

* Med. Stat., U. S. A., p. 414.

† Med. Stat., U. S. A., p. 419.

charge the atmosphere with positive electricity, which is sometimes strikingly exhibited by the display of zigzag lightning, and loud *thunder*, without *rain*; these electrical phenomena frequently begin and end with an earthquake. In the western part of the county of Socorro, not far from Fort Conrad, there is a mountain, from the base of which flow several warm springs, which evidently is, at times, under the influence of subterranean heat, as snow melts from its surface much sooner than it does from other parts of the same ridge, of more than two thousand feet less elevation. There was in the vicinity of this mountain, from the 11th of December, 1849, to the 14th of February, 1851 (15 months,) twenty-eight earth quakes, the most of them severe and generally accompanied with a rumbling noise. From the great transparency of the air of this particular region, clouds, it is said, can be seen two hundred miles off, whilst at other places, as at Las Vegas, from the admixture of *mica* with the soil, the *mirage* is very great.

The water of the rivers and smaller streams, except during spring freshets, when they are known to contain in solution various deleterious ingredients, are thought to be generally of a healthy character; that of the springs, both cold and thermal, particularly the latter, from similar causes, besides being unpalatable to those unaccustomed to their use, frequently produce disorders and derangements of the digestive organs.

Santa Fe.—This city, the capital of this territory, stands at an elevation of nearly seven thousand feet above the level of the Gulf, in latitude $35^{\circ} 41'$ north, and longitude 29° west. It is situated at the base of a snow-clad mountain, on the north bank of a beautiful little stream, the Rio de Santa Fe about eighteen or twenty miles from where it empties into the Rio Grande. Its population, including that of several surrounding villages embraced within its corporate jurisdiction, amounts to nearly nine thousand. Dr. Drake, upon the authority of Dr. Gregg, informs us (vol. 1, p. 155,) that from topographical peculiarities, ponds and marshes, and the diseases, *periodical fevers*, to which they give origin elsewhere, are almost unknown here, and that as great a degree of good health and longevity are attained and enjoyed by the inhabitants of this city as by those, perhaps, of any other part of the world.

In proceeding from Santa Fe down the Valley of the Rio Grande, we meet with but very few of the reported causes of malarial fever, until we reach the neighborhood of Fort Craig, where the river bottom appears to present all the necessary elements for its production. From this point south to Fort Thorn, with no difference whatever in the geological structure of the Valley, we find malarial fever fully developed and of a high grade.

Fort Thorn.—This fort is situated about one mile west of the Rio Grande, in the neighborhood of the Mexican village of Santa Barbara, and opposite the *Iornado del Meurto*, from which, at a distance of about five miles on the east, it is separated by the river and a range of high mountains; it is 201 miles southwest of Santa Fe, and fifty-one miles north of Fort Fillmore, with an elevation above the Gulf of Mexico of 4,600 feet. Its immediate site is about one hundred yards west of the river bottom, upon ground composed of clay and sand, the former being uppermost; latitude $32^{\circ} 47'$ north, longitude $30^{\circ} 20'$ west. To its westward, about two miles, commences a *Llano* or *mesa*, which extends back, partially broken by a few undulating hills, to the distance of nearly thirty-five miles; the soil between the fort and this *mesa* is sandy, and covered with a low growth of *prosepsis* and *artemesias*. Opposite the fort, the Rio Grande makes a considerable bend, leaving exposed to the right a crescentic flat, interspersed with pools of standing water, partially shaded by trees of the cotton wood species, and subject during the spring freshets of the river, to *complete inundation*. This flat or bottom, during the months of June or July (the hot season,) when the mean monthly temperature ranges from 80° to 82° Fahrenheit, with an occasional daily maximum of from 108° to 110° , presents to the action of the sun a surface of *oozy mud* covered with *green slime*, and filled with decomposing vegetable materials. The buildings constituting the fort are within a stone's throw of this *malarial hot-bed*, and unfortunately so placed as to enable, or rather force, the garrison, for at least five months of the year, to breathe its *pestiferous vapors*.

In July, 1855, remittent fever commenced and prevailed here until about the 1st of September, when intermittent fever appeared to take its place. During this month, out of a com-

mand of ninety men, seventy-eight were sick with remittent fever; the remittents this year were never preceded by a chill, and in a majority of the intermittent cases, the functions of the liver were very much deranged. During the summer and fall of 1858, both intermittent and remittent fever of a very aggravated character, prevailed to a considerable extent. In the intermittent, the cold, hot and sweating stages were very accurately defined. Later in the season, gastric and biliary complications were present, with a strong tendency to inflammation of the lower bowels. In the chronic intermittents, engorgement of the spleen was also frequently present.*

Dr. Henry observes, that at this, the sickliest Post in New Mexico, if the cases were not properly treated, nearly every man, after a series of attacks of *ague and fever*, would be seized, as the Mexicans above and below us are, with a *congestive type of fever*, and die.† On account of the continued prevalence of intermittent and remittent fever, together with the malignant character of some of the cases, the Secretary of War, at the request of the Surgeon General, in 1858, ordered a permanent evacuation of this Post. South of this military station, Donna Ana, Cruces, Fort Fillmore, and the Masilla Valley, where vegetable materials are abundant, after the drenching rains of July and August, under a temperature sometimes reaching 107° in the shade, become during the fall great centres of *malarial fever*. To the westward of this region, along the whole length of the thirty-second parallel of north latitude, across the territory of Arizona, to the mouth of the Rio Gila, wherever settlements are found, there malarial fevers prevail.‡ Notwithstanding the great elevation, and diminished atmospheric pressure, throughout a greater portion of this territory, and the mountainous regions, to its north and north-west, wherever we find moisture, and vegetable materials in certain proportions, under a mean monthly temperature for two months, of 60° and upwards, there we find malarial fever. In proof of this assertion, we beg leave to refer to the very interesting reports of Drs. Bartholow|| and Brewer,§ and in which we are informed, that at elevations ranging from five to seven

* Med. Stat., U. S. A., p. 224.

† Med. Stat., p. 222.

‡ Med. Stat. U. S. A., Report of Surg. and Med. Dir. Wm. J. Sloan, p. 218.

|| Med. Stat., pp. 283-288-300-306.

§ Med. Stat., p. 310.

thousand feet above the level of the ocean and clearly within the upper, or cold region of meteorological writers, there prevailed amongst the troops (Army of Utah) on Horn's Fork, and at Camp Scott and Fort Bridger, on Black's Fork of Green River, Utah Territory, during the summer and fall of 1858, and again in 1859, at Camp Floyd, in Cedar Valley, about forty miles south of Great Salt Lake, a *paroxysmal fever*, denominated by the residents of the country, *mountain fever*, but in their opinion (and in which we fully concur) a fever clearly of *malarial origin*.

Arizona.—This territory is bounded on the south by the Mexican State of Sonora, on the north by Utah, on the east by New Mexico, and on the west by Nevada and California. Its general surface which lies at an elevation of from one hundred to four thousand feet above the level of the Gulf of California, like that of New Mexico, consists of a succession of mountain ranges, having a general north and south direction. These mountain ranges, some of which, as those of Santa Rita, rear their rugged peaks to the height of near twelve thousand feet, are separated from each other by level plains averaging from twenty to forty miles in breadth. These plains, some of which are inundated during the month of July, and which are void of every trace of vegetation, are left after the removal by evaporation of the water from their surfaces, covered with an extensive deposit of *nitrate of soda*, which, at a distance, gives to them the appearance of vast lakes; of these the most extensive and lake-like in appearance, and from the surface of which the mirage, probably is greater than any other, is the *Plaza de los Pimos*. Its principal mountains are the Pinaleno and Magellan ranges. Its rivers are the Colorado of the West, the Gila, the De Lino, and their tributaries. They all originate within the Rocky Mountains, or some one of its numerous spurs or outlyers, and discharge their waters through the Colorado into the Gulf of California. The basin of the Rio Gila, by *irrigation*, is said to produce cotton, wheat, Indian corn and garden vegetable. The Valley of the Santa Cruz extends north from the mouth of the Sonorita, a tributary of the Gila, to *Tucson*, the present territorial capital, and is, together with the whole surrounding country, during the fall months, subject to *malarial fever*. To

the north, and west of *Tucson*, is a desolate and desert-like region comparatively worthless except on account of its mineral wealth. Along the rivers and in their valleys are found growing ash, sycamore, cotton-wood, hack-berry, walnut and mesquite; on the plains, live oak, white oak, mesquite, iron wood, cedar and maple, and on the mountains, in great abundance, pine, cedar, fir and spruce. In many of the mountains on the Gila and its tributaries, granular gold has been recently found in large quantities, and silver, lead, copper, antimony, graphite and alum abound almost every where. The silver, gold and copper mines were, in 1859, extensively and profitably worked. Some of the former are said to rival in extent and value, the most famous of Peru and Mexico.

Fort Buchanan.—This fort is situated on a small tributary of the Rio Santa Cruz, in the midst of a mountainous region, at an estimated elevation of some 5,350 feet above the level of the Gulf of California, and about midway between the Rio Grande and Rio Colorado of the west, in latitude $31^{\circ} 40'$ north, and longitude $33^{\circ} 30'$ west. The immediate site of the fort, which consists of a series of temporary buildings, scattered over a distance of half a mile, is on the western slope of an irregular plateau of about two miles in length, and from half to three-quarters of this distance in width. This plateau, the termination of a series of low broken hills on the north, is irregularly elevated some thirty or forty feet above the level of an adjoining *swamp*, and by which it is, at no great distance, on its eastern, western and southern sides, completely *environed*. This swamp or morass, consisting of alluvial deposits and extensive beds of decomposing vegetable materials, the result of the rank, forced vegetation of the *hot season*, is watered by several warm and cold springs, which running over its surrounding level surface, forms it into a *great peat marsh*, in which are several quagmires and filthy, stagnant pools. The southern extremity of this swamp, which has been, until very recently, kept constantly *irrigated* during the summer, for the purpose of cultivation as a garden, lies between two hills, which form a funnel-shaped gorge, through which the prevailing winds of the year, the *south* and the *south-west*, blow the *effluvia* generated in it, under a temperature which sometimes reaches 107° in the shade, *directly upon the inmates of the fort*. The water used by

the garrison is supplied by one of many springs of this swamp, and although clear and palatable, is most *execrable*, being highly impregnated with calcareous salts and decomposing vegetable materials, becoming putrid upon standing, and producing diseases (diarrhœa and dysentery) of the digestive organs.

Although the winters here are cold, ice sometimes freezing half an inch thick, still the morning and evening air is agreeable and bracing, and notwithstanding the thermometer during the months of June, July, August and September, frequently rises above 100° in the shade, on account of the cool breezes that are constantly blowing from the mountains, it is *never oppressingly hot*. Forty or fifty miles south of the high table lands, upon the southern edge of which this fort stands, and from which the descent into Sonora is very abrupt, we reach a tropicoid region, in which oranges and figs grow in great luxuriance, and where, every fall, fevers of a most *pernicious and congestive type, prevail*.* From topographical peculiarities, ever since the first occupation of this post, as might have been expected, the garrison have constantly suffered; but more especially from July to January, with malarial fever, frequently of an aggravated character; from an attack of which, in 1858, not one solitary person escaped, with the exception of the sutler's employés and an old negro woman, who were protected from the influence of the marsh by a small knoll, which acted as a diverting screen against the carrying influence of the *south-west wind*.†

Fort Mohave.—This post stands on the east bank of the Colorado river, at Beal's crossing, near the head of the Mohave Valley, in latitude about 35° north, and longitude 37° 31' west. It is situated immediately on the edge of an elevated desert plain, seventy-five feet above the river. This plain, hemmed in by rocky, naked hills, forms a basin fifty miles long, by twenty in width, through which the Colorado winds its way, forming the Mohave Valley; a bottom, thirty-five miles in length, and averaging from one to four miles in breadth. The whole surrounding country, with the exception of this bottom, is a perfect waste, without either water or vegetation, and is

* Med. Stat. U. S. A. Report Surg. Med. Director Wm. J. Sloan, 1859, p. 218.

† Med. Stat. U. S. A., p. 207.

characterized by *excessive summer heat, extreme dryness, strong winds, hurricanes, sand storms and whirlwinds.*

Although but little rain falls at this post during July and August, very heavy showers, accompanied with thunder and lightning, fall in the neighboring hills. From the melting of the snow on the mountains in June, if not earlier, the bottom lands of the Colorado and all its tributaries, are overflowed. The soil of these bottoms, when not mixed with too great a proportion of the *nitrate of soda*, and properly cultivated, are said to produce moderate crops of corn, beans, pumpkins and melons.*

From the head of the Gulf of California, eighty miles up to the mouth of the Rio Gila, latitude 32° 32' north, longitude 27° 30' west, and for some distance above this point, the Valley of the Colorado averages from five to eight miles in breadth, and is bounded on either side by rocky barren mountains, and sand hills, which separate it from the *immense surrounding deserts.* The surface of this region as far as it has been observed, is reported to consist almost entirely of sand, and like that opposite Fort Mohave, is subject to *sand storms and hurricanes.* Of the temperature of this region we know nothing,—but infer, after carefully examining the monthly and daily maximum temperature at Fort Yuma, California, situated in the midst of the great Colorado desert, two or three hundred yards to the west of the mouth of the Rio Gila, and comparing them with others, particularly those of the desert regions of Africa, that while it probably has the highest summer temperature of any military station ever occupied within the limits of the United States, it is surrounded by a region, the maximum daily, and mean July temperatures of which are as great, if not greater, than any other part of the world.†

As regards the prevalence of *periodic fever* throughout this

* Med. Stat. U. S. A., p. 335.

† At Fort Yuma, the temperature is, for the summer, 92° for the month of July, for two successive years, it was over 95°, with a single maximum, in 1856, at 2 and 3 o'clock, P. M., of 116° and 119°. In preceding years, the maximum daily, in this the hottest month, is reported to have frequently exceeded these measures from 8° to 10°. The temperature in the Oasis of Mourzouk, Sahara, Africa, is reported to range from 117° to 128°. (Med. Stat. U. S. A. Letter from Asst. Surg. H. K. Wirtz to the Surg. General, p. 457, and report of Louis Blodget, Esq., Army Meteorological Register, p. 684.)

territory, or even at the military stations mentioned, with the exception of Fort Buchanan, we are not informed, but infer, if ever settled, from its high summer temperature, that wherever moisture and organic materials are found in sufficient quantities, and certain proportions, there malarial fevers will prevail. On the part of the United States, many of her military commands, in their efforts to occupy this territory, that of New Mexico, the Valley of the Rio Grande, Western Texas, and the Indian Territory, on account of the scarcity of vegetables, besides frequently giving to their fevers, a rather *low type*, suffered very much from diarrhœa, dysentery and scurvy, and continued to do so, until comfortable quarters were provided, and a sufficient amount of vegetables issued in the ration.

Animals, Reptiles, Insects and Birds.—Of these we will only mention the following, which if ever met with at all, in any portion of the Southern and Southwestern States, during their first settlement, with the exception of *tropicoid* Florida, are now entirely extinct. The leopard, the South American lion, or puma, the Mexican lion, the tiger, tiger cat, the mustang, or jackass rabbit; the hooded or horned rattlesnake, found on the sand plains of Arizona; the prairie racer, a long yellow snake; the coralito, a very small delicate snake, fatally poisonous; the lyphenous, or vinegrilla: this animal, when irritated, emits a strong odor of vinegar, hence its name, and is fatally poisonous; the escupion, or hissing, spitting lizzard, believed not to be poisonous. In pools, near Fort Defiance, New Mexico, a very curious animal, believed to be the sirenon or singing frog; the horned frog; the tarantula, very dangerous and poisonous; the centipede, very poisonous; the prairie or bird of paradise; the paroquet, and chapparel cock. As regards the distribution of some of these animals and reptiles, we only consider it necessary, in a climatic point of view, to state that on the first occupation of Fort Belknap, Texas, one hundred and twenty miles north-west of Fort Worth, tigers were found in its vicinity, at Phantom Hill, the panther, the prairie racer, centipede and jackass rabbit; at Camp Johnson, on the head waters of the Colorado, tiger cats; at Fort McKavett, the Mexican lion, bird of paradise, and tarantulas, the surrounding country is arid and sterile; at Fort McIntosh, the leopard, and South American

lion, or puma; at Fort Buchanan, the leopard, the coralito, the escupion, and the vinegrilla; centipedes are found here measuring ten inches in length, and one in width, and tarantulas eight inches long, with fangs one inch in length.

In here bringing to a close our imperfect geographical, medico-topographical, statistical, and historical account of the great region under consideration, if we attempt to reproduce some of its leading physical features, we discover that South of the thirtieth parallel in Florida, Louisiana and Texas is a *tropicoid region*, in portions of which are found a few tropical trees, animals and insects, together with many tropical birds, fruits and flowers; in other portions of this region which throughout is emphatically that of *long moss, moschitors, and alligators*, is or could be profitably cultivated, together with some other tropical products, sea island cotton, sugar cane, and rice. To the north of this parallel on or near the coasts of the Carolinas, in Georgia, Alabama, and on the Mississippi river, north of its delta, are *localities and small districts of country*, the topographical and meteorological peculiarities of which are such, as to give to them, *at least during the summer and fall months*, also unmistakable *tropicoid climates*.* The climate of the *Arid region* extending south from the Indian Territory, along the western frontier of Texas, and embracing the "Llano Estacado," the middle Rio Grande, Southern New Mexico and the valley, together with the region bordering thereon, of the Colorado of the west, in south-western Arizona, with the exception perhaps of a small tropicoid region, [the Mesilla Valley] in Southern New Mexico, is probably on account of its *aridness, barrenness, high temperature, sand-storms and whirl-winds, more desert-like than tropicoid*, [with the exception of the mountainous regions of New Mexico and Arizona.] The remainder of the South-western, Southern Atlantic and Gulf States, with a general southern inclination throughout their middle and southern portions, more particularly the latter, present to the action of the sun a great inclined plain furrowed with sluggish streams, and interspersed with extensive swamps, containing, during the summer and fall months, decomposing organic materials in abundance, thus creating and presenting to the mind of the believer in the malarial ori-

*The Dead Sea region although lying entirely north of the thirty-first parallel of north latitude, has strictly a tropicoid climate.

gin of fever, not only numerous and extensive laboratories for the manufacture of his favorite agent; but actually offering in connection with the medico-topographical history of the Dead Sea region, as will hereafter be shown, a few facts in elucidation of some of the most obscure and long disputed points connected with the generation and elimination of this most mysterious agent.

Meteorology.—The term climate, we believe, in an ætiological sense, is generally used to express states of the atmosphere, and these states as consisting in varying quantities of certain of the elements of the air itself; such as heat, light, electricity, mists, and clouds; dews, rain, hail, frost, snow, and density, or weight, and winds; together with the different ascending gaseous exhalations, from decomposing matters lodged on the surface of the earth. With this rather imperfect definition of the term climate, we are now prepared to examine some of its elements in detail, but before doing so, we will merely observe, that the actual presence of some, and relative proportions of others, are frequently no more the result of a high temperature than of topographical peculiarity.

Temperature.—If we assume the Tropic of Cancer as a base line, with a mean annual temperature of 82° , and calculate a decrease of $1^{\circ} 16'$ of mean temperature for every degree of latitude North to the thirtieth parallel, it gives us about 70° as the mean temperature of this parallel; and from this line, allowing a decrease of $1^{\circ} 30'$ for each remaining degree, with a reduction of one degree for every two hundred feet, where the elevations are abrupt, and four hundred on the great inclined plain to the west of the Mississippi, we obtain for the thirty-sixth parallel the temperature of about 62° ; and for the entire region under consideration, an annual mean temperature of not far from 66° . These calculated mean temperatures it must, however, be borne in mind, are only offered in the absence of more reliable data, as mere doubtful approximations to the truth.

Again, if we take 14° the mean annual temperature of the summits of the Rocky Mountains, and 51° and 54° that of the Blue Ridge through the Carolinas and Georgia, and the terminating spurs of the Cumberland range in North Alabama, and

compare them with 71° and 92° , the minimum and maximum temperatures of the Gulf of Mexico and Atlantic Ocean, we at once, through the agency of the winds, discover a sufficient cause for the sudden changes of temperature we so frequently experience.

On comparing the mean annual, quarterly and monthly temperatures, contained in the accompanying tables [Abstracts A and B] carefully compiled from every reliable source within our reach, with those of the equatorial regions lying south of the base line already indicated, we discover that the increased summer, and monthly temperatures of the months of June, July and August met with in New Orleans, and at Forts Brown and Duncan, over those of Key West, and clearly the result of the peculiar physical features of the regions by which they are surrounded, do not really, as the temperature of the month of May at Cumano, in South America is $84^{\circ} 56'$, and that of August in Havana, Cuba, $85^{\circ} 34'$, constitute exceptions to the general law of a regular decrease of temperature as we ascend upon nearly the same lines of longitude from the Equator to the poles. They also further show that as we ascend from the modified atmosphere of the coast, where the seasons almost imperceptibly glide into each other, into the interior, the difference between them regularly *increases*, and the climate becomes *colder* and more *variable*.

From the few thermometrical tables we have had an opportunity of examining upon the subject, it appears that the daily range of the mercury is lower upon the coast, the bays, the interior lakes, and for some distance up the larger streams, than it is at other points within the same parallels, and remote from these; and that consequently the climate is more or less *excessive*, even within the same parallels of latitude, in proportion to elevation and removal beyond their influence.

Rain and the Rainy Season.—From the accompanying rain table. [Abstract C.] It appears that the annual average fall of rain, as a general rule, is greatest within the maritime regions, and least along the south-western frontier of Texas, the middle Rio Grande, and southern New Mexico, than anywhere else. Throughout the last named region, together with that as reported bordering on the Gila and Colorado of the west, the

amount of rain is so very small, compared with the region lying within the same parallels of latitude east of the Mississippi, that the latter, has been not very inappropriately styled the *arid or desert region*. It also appears that as a general rule the greatest amount of rain falls, during the months of *highest temperature*. The assertion of Dr. Hort* after twenty years experience, on the Gulf of Mexico, in Florida and Louisiana, that there is a *drought* from the first of May to the middle of June, is not sustained by the rain tables, for this region, contained in the Army Meteorological Register; neither do they sustain, the opinion expressed by Dr. Fenner,† that the *rainy season* in New Orleans is during the months of June and July, any further, than perhaps as much rain falls *there*, during these months; as any other two months of the *hot season*. But as it is we believe a very well ascertained fact that the dryness or moisture of the atmosphere cannot be determined by the quantity of rain that falls, or the relative number of clear or cloudy days, we will, in the absence of a sufficient number of hygrometrical observations, have to rely for the elucidation of this point upon the acknowledged dryness or moisture of particular regions and localities.

Dew Point.—By this phrase we understand that degree of temperature at which moisture begins to be deposited from the air—for example: if we submit two volumes of atmosphere at the temperature of 100° , to a cooling process, and one of them commences depositing dew at a reduction of 20° , and the other at 30° , the one from which dew is first deposited contains the most moisture, and is said to have the higher dew point. The complement of the dew point is the range through which the mercury falls before dew appears; when this point is reduced to nothing, and coincides with the temperature of the air, saturation exists and evaporation ceases.

The three great regions, within the limits assigned to this essay, believed to differ most in their absolute atmospheric vapor and dew point, are, first, its sea and gulf coasts; and secondly, and thirdly, the regions to the north of these, and to the east and west of the Mississippi River.

* New Orleans Med. and Surg. Jour., Vol. 7, 1851, p. 758.

† Southern Medical Reports, Vol. 1, 1850, p. 28.

Region of the Coast.—The atmosphere of this region, from the Rio Grande to the Cape Fear River, with a mean annual temperature of nearly 70° , has constantly, from the great extent of watery surface over which it rests, a high dew point, with a small complement. Hygrometrical observations, at least for a portion of the summer and fall months, made at Fort Moultrie, South Carolina,* Fort Dallas, Florida,† New Orleans, La.‡ and Fort Brown, Texas,|| sustain this assertion.

Regions to the East and West of the Mississippi.—The atmosphere of these regions, with a mean summer temperature of nearly 80° , like that of the sea coast would be, under favorable circumstances, capable of sustaining a high dew point; but on account of their elevation, and remoteness from the ocean and gulf, no less than the arid and heated regions lying to the west and south-west of the western region, we conclude their dew point is frequently low, particularly around their northern and western borders.

Winds.—When a portion of the atmosphere is heated, it becomes lighter, and rises, and the colder and denser air around flows toward the base of the rarified columns; in this way, both local and general winds are created. When they blow from a warmer to a colder region, the temperature of the latter is raised, and the reverse; they are, therefore, no less the cause of a change of temperature, than the effect. For the want of sufficient data, we are unable to determine the relative prevalence or proportion of any of our winds; but conclude, that below the thirty-sixth parallel, the south-west, south-east north-west, and north-east are the most prevalent. Of the local the dry south-west is the only one that we will at present notice.

The South-west and South-east Winds.—The commencement of these moist, warm winds, from the bosom of the Gulf of Mexico, and Atlantic Ocean, is frequently attended with storms of thunder and lightning, but generally not of a very violent kind; if the former of these continue for thirty-six or forty-eight hours, clouds high in the atmosphere, moving in the direction of the surface winds, make their appearance, from which,

* Med. Stat., U. S. A., p. 237 and 525.
 † 3 Fenner's So. Med. Reports, p. 101.

‡ 2 Ibid, 150.
 || 4 Med. Stats., p. 183.

either sooner or later, copious showers of rain descend. The *south-west* wind, on reaching the Ozark Mountains, in the State of Missouri, from topographical peculiarities, is believed by Dr. Drake* to be deflected from its regular course, and turned on Fort Gibson, mingled with the *true south-east*.

The North-west and North-east Wind.—These winds, originating around the Arctic Circle, are, when compared with our other winds, always cold. The first of these, in crossing the Rocky Mountains, from the low temperature of their summits, deposits in the form of snow a large portion of its moisture, and then descends and sweeps across the Southern States, as an exceedingly dry and cold wind. In September and October, although the difference between the temperature of the air of these mountain ranges and that rising from the surface of the Caribbean Sea, the Gulf of Mexico, and Atlantic Ocean, is considerable, it does not appear to reach its maximum before February or March, and is then probably more than 100°; during this period, and as the result of these extremes of temperature, the north-west wind around the shores of the Gulf, and as far north as Cape Hatteras, is sometimes converted into a tempest, under the name of “Norther.” The north-east, although a cold wind, is always a more moist and warmer one than the preceding.

The Dry South-west Wind.—This wind, the result of the action of the sun on the inequalities of the earth’s surface, where it originates, may appear in any region, or at any time, and is always, comparatively, a wind of high temperature; although strictly local, it is not without more or less progression, and prevails most in summer and autumn, when the mercury ranges from 90° to 100°. During the month of August, under the influence of this wind, the mercury at Fort Gibson once reached 117°; and the high temperature of June, July and August, at Fort King, in the interior of Florida, and the military posts along the south-western border of Texas, is probably to some extent the result of a similar cause.

* *Principal Diseases of North America*, page 575.

TABLE I.—MEAN TEMPERATURE OF THE YEAR, AND OF THE SEASONS. [Abstract A.]

Sections	Places of Observation	Relations to Seas, Lakes, Deserts or Mountains	Latitude	Longit'de west from Wash.	Ft. above the level of the sea	Mean Annual Temperature	Temperature of the Seasons				Difference between Winter & Summer
							Winter	Spring	Summer	Autumn	
Sec. I.	1 Havana, Cuba.....	East side of the Gulf of Mexico	23° 10'	4° 50'	Gulf.....	77° 34'	72° 68'	76° 28'	82° 32'	78° 08'	9° 64'
	2 Key West, Fla.....	Thompson's Is., East End.....	24 23	4 52	10 feet	76 48	70 05	76 04	81 39	76 96	11 34
	3 Fort Moultrie, S. C.....	Sullivan's Island, Atlantic Coast	32 45	2 45	25 feet	67 00	51 52	67 02	81 56	67 80	30 04
	4 Oglethorpe Barracks, Ga.....	One Mile south Savannah, Geo...	32 05	4	40 feet	67 44	54 06	67 08	80 70	67 90	26 64
	5 Fort Brooke, Fla.....	Tampa Bay, west side of the Gulf	28 00	5 20	20 feet	72 15	63 35	72 70	80 20	73 95	16 85
	6 Fort Dallas, Florida.....	Key Biscayne Bay, Atlantic coast	25 55	5 10	20 feet	74 41	66 58	74 60	81 47	76 27	14 89
	7 Mobile, Alabama.....	Mobile Bay, North Gulf Coast...	30 42	11 15	12 feet	70 29	57 26	70 13	82 75	70 01	25 49
	8 Fort Brown, Texas.....	Rio Grande, South Texas.....	25 53	20 55	50 feet	73 82	62 28	74 52	83 04	74 76	20 76
Sec. II.	1 New Orleans, La.....	Interior, Miss. River, north of Gulf	29 57	12 40	12 feet	70 06	55 23	79 90	83 04	70 78	27 81
	2 Natchez, Mississippi.....	Interior, Mississippi River.....	31 34	14 30	264 feet	66 86	52 18	67 80	80 96	67 06	28 78
	3 Memphis, Tenn.....	Interior, Mississippi River.....	35 08	13 15	400 feet	64 10	41 00	60 20	80 20	62 00	36 20
Sec. III.	1 Mt. Vernon Ars'l, Ala.....	Interior, Alabama River.....	31 12	11 00	200 feet	65 90	51 70	67 01	78 87	66 04	27 17
	2 Wetumpka, Ala.....	Interior, Coosa River.....	32 30	9 18	700 feet	65 50	51 57	68 12	80 4	67 13	28 87
	3 Huntsville, Ala.....	Interior, base of Mount Sano.....	34 45	9 42	600 feet	59 38	42 15	59 96	75 62	54 79	38 14
	4 Augusta, Georgia.....	Interior, Savannah River.....	33 27	4 32	400 feet	64 00	50 71	64 06	78 06	60 39	28 01
Sec. IV.	1 Ft. Gitson, Ind territory	Interior, Neosho River, Ind. ter..	35 47	18	560 feet	62 90	42 50	61 26	79 17	61 53	36 67
	2 Phantom Hill, Texas...	Interior, east of Llana, Estacado	32 02	22 45	2120 feet	63 98	46 16	65 11	80 89	63 76	34 73
	3 Fort Duncan, Texas.....	Rio Grande (Eagle Pass).....	28 42	23 40	1460 feet	70 85	53 92	72 75	84 84	72 25	30 56
	4 Fort Bliss, Texas.....	Rio Grande, opposite El Paso ...	31 46	29 30	3830 feet	63 56	45 75	65 83	79 76	63 91	34 01
	5 Fort Thorn, New Mex.....	South N. Mex. Misilla Valley...	32 44	30 10	4500 feet	61 28	40 53	63 56	80 18	60 85	39 65
	6 Santa Fee, New Mex...	Interior, Capitol New Mexico ...	35 41	29 30	6840 feet	50 59	31 64	49 68	70 46	50 59	38 82
Sec. V.	1 Ft. Buchanan, Arizona	Interior, Mountains, Pacific slope	31 40	34 00	5330 feet	57 94	41 05	57 81	74 49	58 43	33 44

TABLE 2.—MEAN TEMPERATURE OF THE MONTHS. [Abstract B.]

Sections	Places of Observation	January	February	March	April	May	June	July	August	September	October	November	December	Names of hottest and coldest months	Difference between them
Sec. I.	1 Havana, Cuba.....	69° 98'	71° 96'	75° 74'	78° 98'	83° 58'	84° 12'	84° 39'	85° 84'	83° 04'	79° 52'	75° 56'	71° 78'	Aug. and Jan.	15° 86'
	2 Key West.....	69 46	70 26	73 83	75 35	78 98	81 03	82 53	81 98	81 19	72 21	74 22	70 52	July and Jan.	13 09
	3 Fort Monroe.....	50 08	51 71	59 08	66 95	73 98	79 85	83 29	81 53	75 15	66 60	61 92	53 76	July and Jan.	30 21
	4 Oglethorpe Barracks.....	57 29	53 17	59 90	66 90	73 47	78 96	82 20	81 13	81 83	63 25	63 25	59 70	July and Feb.	29 03
	5 Fort Brooke.....	61 53	63 54	67 34	72 25	76 64	79 46	80 72	80 43	79 35	74 02	66 74	61 99	July and Jan.	21 19
	6 Fort Dallas.....	66 88	66 56	70 33	75 57	77 97	80 57	82 12	81 78	79 59	77 96	71 27	66 80	July and Jan.	15 74
	7 Mobile.....	57 59	57 90	62 40	70 64	77 45	81 64	83 68	82 91	79 99	69 55	62 59	56 30	July and Dec.	27 38
	8 Fort Brown.....	59 80	64 40	69 21	75 14	80 21	82 32	83 95	83 83	80 67	74 49	69 14	62 64	July and Jan.	24 15
Sec. II.	1 New Orleans.....	56 42	59 17	68 60	73 71	78 96	83 09	83 90	83 27	80 23	71 69	61 81	34 30	July and Dec.	29 52
	2 Natchez.....	52 27	54 51	59 66	69 85	74 52	80 71	81 32	80 85	77 18	67 01	56 98	49 73	July and Dec.	31 59
	3 Memphis.....	42 00	46 00	51 00	62 00	68 00	82 00	82 00	77 00	71 00	57 00	58 00	44 00	June and Jan.	40 00
Sec. III.	1 Mt. Vernon Arsenal.....	50 44	53 69	60 26	66 87	73 92	78 03	79 39	79 19	75 74	65 93	56 47	50 97	July and Jan.	28 85
	2 Wetumpka.....	50 58	56 18	60 78	70 49	73 28	80 87	81 30	80 81	75 52	69 46	61 02	50 36	July and Dec.	30 94
	3 Huntsville.....	42 06	42 59	51 34	61 30	67 25	74 23	76 39	76 24	70 15	59 50	49 74	41 81	July and Dec.	34 58
	4 Augusta.....	54 04	49 08	55 08	68 03	69 06	78 02	81 00	77 09	72 07	59 05	50 07	39 02	July and Dec.	42 03
Sec. IV.	1 Fort Gibson.....	40 15	42 41	52 19	62 30	68 79	76 49	80 76	80 24	73 50	61 56	49 72	40 84	July and Jan.	40 61
	2 Ft. Phantom Hill.....	42 92	49 31	58 02	66 39	71 93	76 46	80 73	81 49	74 43	63 59	53 26	46 26	Aug. and Jan.	38 57
	3 Fort Duncan.....	52 07	57 34	65 10	73 44	79 72	82 81	84 67	85 96	82 25	72 64	61 86	52 34	Aug. and Dec.	33 62
	4 Fort Bliss.....	44 77	48 57	57 23	65 55	74 73	81 28	80 90	75 81	73 86	65 93	51 95	40 92	July and Dec.	41 27
	5 Fort Thorn.....	39 44	47 65	54 86	65 01	71 81	80 29	81 33	78 30	72 30	62 57	46 59	34 51	July and Dec.	46 82
	6 Santa Fee.....	31 45	33 25	40 71	51 28	57 06	68 84	72 52	69 98	61 93	51 27	38 57	30 21	July and Dec.	42 36
Sec. IV. 1.	Fort Buchanan.....	39 17	45 36	47 35	59 56	66 51	74 66	75 62	73 18	70 16	59 04	45 65	38 61	July and Dec.	37 01

TABLE 3.—SHOWING THE GEOGRAPHICAL POSITION OF THE PLACES OF OBSERVATION, THEIR CLIMATIC CHARACTER, THEIR ANNUAL MEAN, AND MEAN QUARTERLY MEASUREMENTS OF RAIN; AND ALSO THEIR RAINY SEASON. [*Abstract C.*]

Sections	Places of Observation	Geographical Position	Climatic Character	Winter	Spring	Summer	Autumn	Annual amount in inches	Am't of rain for Summer and Autumn	Rainy Season
1	Havana.....	Northwestern Coast of the Island of Cuba	Tropical.....	7 31	8 34	16 59	15 36	65	.....	From 15th May to 15th Nov.
2	Key West.....	E. end of Thompson's Is., Gulf of Mexico.	Tropicoid.....	8 04	8 56	28 24	10 63	47 65	31 94	From 1st June to 1st Dec.
3	Fort Brooke.....	West Coast of Florida.....	Tropicoid.....	7 52	9 89	17 45	10 06	55 47	38 87	June, July and August.
4	Fort Moutrie.....	Sullivan's Island, Atlantic Coast.....	Tropicoid.....	9 17	13 45	23 50	7 21	42 90	27 70	From 1st June to 1st Dec.
5	Oglethorpe Bar'cks	Twelve miles from the Atlantic Coast.....	Tropicoid.....	18 27	14 24	17 97	13 90	53 33	30 70	From 1st June to 1st Dec.
6	Mobile.....	Mobile Bay, N. of the Gulf of Mexico.....	Tropicoid.....	12 71	11 29	17 28	9 69	66 91	31 89	From 1st June to 1st Nov.
7	New Orleans.....	Mississippi R., 40 miles from the Gulf Coast	Tropicoid.....	5 34	3 87	9 25	15 08	50 90	16 97	From 1st June to 1st Dec.
8	Fort Brown.....	R.Grande, 20 miles from the Gulf of Mexico	Tropicoid.....	2 42	3 55	9 91	6 32	33 65	24 34	From 1st June to 1st Dec.
9	Fort Duncan.....	Rio Grande, at Eagle Pass.....	Tropicoid.....	.....	.....	.....	.....	22 20	16 23	From 1st June to 1st Dec.
<hr/>										
1	Phantom Hill.....	Near the East'n border of Llano Estacado.	Desert.....	2 00	3 84	4 08	7 30	17 20	11 38	From 1st June to 1st Dec.
2	Fort Bliss.....	Rio Grande, nearly opposite El Paso.....	Desert.....	1 70	0 70	3 56	5 25	11 25	8 81	From 1st June to 1st Nov.
3	Fort Thorn.....	Rio Grande, opp. the Jornada del Muerto.	Desert.....	0 36	1 44	8 32	4 49	16 06	12 81	From 1st June to 1st Dec.
<hr/>										
1	Augusta.....	On the Savannah River.....	Temperate...	8 05	6 78	3 66	4 45	23 00	8 17	Winter and Spring.
2	Huntsville.....	At the base of Mount Sano.....	Temperate...	15 42	14 87	14 57	9 99	54 81	24 56	Winter and Spring.
3	Natchez.....	Mississippi R., 264 ft. elevation above Gulf	Temperate...	16 00	15 25	15 36	12 91	60 12	28 27	.....
4	Fort Gibson.....	On the Grand or Neosho R., Indian Ter...	.....	6 15	11 38	9 68	9 25	36 46	18 93	1st May to 1st September.
5	Fort Buchanan.....	W. of the Rocky Mountains, Pacific Slope	Temperate...	3 30	0 50	16 11	5 91	25 82	22 02	July, August and September.

PART SECOND.

Malarial Fever.—If we admit that the entire exemption of Forts Livingston, McIntosh, and Duncan from intermittent and remittent fever clearly proves, and which, under the circumstances, we are bound to do, that neither a high temperature, a high dew point, or the near approximation of the latter to the temperature, are sufficient, either singly or combined, to produce any of the varieties of malarial fever, we are forced either to remain in ignorance of their *efficient* cause, or seek it outside of these, or any other mere atmospheric change of the locality where they occur; but that there does exist, as the remote cause of fever, a gaseous poison, an *intangible element*, the result of decomposing organic remains, we think clear, from the fact that wherever we find a large amount of vegetable matter in connection with certain degrees of heat and proportions of moisture, there we meet with febrile diseases; to this effect we have the concurrent testimony of the profession everywhere, and we would as soon think of denying its existence on account of the experimental failures of Broschi and Moschati, made in the most pestilential regions of the Campagna di Roma, and on the air of some insalubrious rice fields in Tuscany, for the purpose of discovering its presence, as we would to conclude there are no roses, because chemistry has thus far failed to furnish us with the means of detecting *odours* in the air.

Believing there is no intelligent Southern physician who has taken the trouble to examine the subject, that pretends to deny the malarial origin of intermittent fever, we conclude if anything more were necessary to show a similar origin of the other varieties, the history given us by Dr. Heustis of the bilious-remittent, or yellow fever, that prevailed in Cahawba during the summer and fall of 1821, before steamboat navigation had been introduced on the Alabama river, that of Dr. Gantt, of its occurrence in the Pleasant Valley during the fall of 1824, when there was no yellow fever in Mobile, together with that of Dr. Moore, (not to mention other examples,) of its clearly local origin at Fort Brown, during the fall of 1853, are sufficient, and, we think, ought forever to set the matter at rest.

Having shown (in part the first,) during the summer and fall

months, in some of the cities and towns around the coast, and for some distance up the valleys, and on the banks of some of the principal streams, the occasional prevalence of all the varieties of malarial fever, and in others, the more elevated, colder and dryer regions of the interior, the continued *absence* of yellow fever, if not some of the other varieties. We will now briefly allude to some of the laws upon which this relative difference in prevalence appears to depend; and then, at least for the present, dismiss this part of the subject.

From as careful an examination of the history of malarial fever as we have been able to give the subject, it appears that the elements necessary for the production of the milder grades, are a mean monthly temperature of about 60° , in connection with certain proportions of moisture and vegetable matter; and for the higher, an increase of the monthly temperature to 80° , with a high dew point and small complement; and although the former is said to cease prevailing on a reduction of the temperature to 50° , and the latter at 70° , we know that where the heat of the preceding nine months has been greatly over these points, their respective *types* continue to show themselves *sporadically* throughout the winter months.

* * * * *

The great distinctive characteristic of malarial fever consists in its remissional features, so clearly is this element engrafted upon the physiognomy of the entire class, that we believe, within the limits assigned, to this essay, at least during the summer and fall months, an *adiopathic fever*, not characterized at some period of its progress, by distinct remissions and exacerbations, outside of the contagious exanthematous fevers except as the result of inflammation of some one or more of the principal organs, or tissues of the body, or from exhaustion, never occurs. That remittent fever from the supervention of some one or more of the above mentioned causes, does sometimes during its progress, lose its paroxysmal features and degenerate into a low grade of febrile action, is a fact no one at all familiar with our endemic fevers will pretend to deny. Upon this subject, the *continued stage of remittent fever*, we are informed by Dr. S. H. Dickson, that, "It is not uncommon, especially among the most perfectly acclimated adult natives, resident in malarial localities, and

strangers long familiarized to our atmosphere, to find bilious remittent fever, lengthening itself out to a tedious protraction, the patient sinking after the tenth or twelfth day into a low state of fever, resembling the less severe grades of typhus; and hence obtaining among us the designation of the *typhoid stage* of bilious fever." In this stage in which the well-marked lines that separate the periods of exacerbation and remission, are almost effaced, and the characteristic periodicity almost obliterated; the pulse is small, or corded, the tongue throws off its fur, and is smooth, red and dry, or smeared over like the teeth and lips, with foul sordes, the stomach loses its irritability and the vomiting ceases; the stools are dark, or even black, meteorism occasionally shows itself, there is muttering delirium, or disposition to heavy stupor and coma; the countenance is dull and inexpressive, muscular langour, and great debility ensue, with nervous tremors, on motion, and perpetual subsultus tendinum. This stage Dr. Dickson considers almost indefinite in its duration, having known cases, in three instances, protracted to thirty, thirty-five and fifty days, though the average, he observes, would scarcely reach beyond fifteen or twenty. In addition to the foregoing symptoms, he might, with propriety, have mentioned the occurrence in some cases of extravasated blood, under the cuticle, in the shape of ecchymosed blotches, at first generally of a purple or bluish color, and varying in size from the head of a small pin, to that of a silver three-cent piece, in others hemorrhage from the bowels, nose and inside of the cheeks; and again in others of enlargement and suppuration of the parotid and submaxillary glands. As M. Louis, who was certainly very well qualified to determine, admits,* that the *typhoid fever of Paris*, and the *typhus fever of the British Isles, and Continental Europe*, are the same disease, and as we know, these fevers originate and have their greatest prevalence in countries and localities where the malarial element has never, within the memory of man, been present in sufficient quantity to produce even the most mild and simple form of *periodical fever*; together with the fact, that under our genial sun and democratic institutions, when imported in the persons of emigrants and landed on our shores, they fail to propagate them-

* Elements of Medicine, Second Edition, page 242-3.

selves and soon die out; brings us to the conclusion that the term *typhoid*, cannot, with any degree of propriety whatever, be applied to any period, not even their latter stages, of either our *pure* or *complicated* forms of malarial fever. That the high temperature and sudden changes to which we are exposed, predispose to visceral engorgement; and that these obscure *hyperæmias* thus created, sometimes ^{from} to the commencement, in those of feeble constitution, or long resident among us, *prevent* or *mask* the *remissional features* of our *autumnal fevers*, is a fact we have never felt disposed to deny, or even doubt, but that this type of fever which sometimes, during its early stages, assumes a clearly periodical or remissional form, or on the other hand, the continued stage of remittent fever, are either of them ever with us so far changed as to present us with their supposed primary *typhus* or *typhoid type*, as met with in the cities of Glasgow or Dublin, the conditions under which they are known to originate and prevail, we think, utterly forbid.

Continued Fever—Symptoms.—An attack of this variety of fever most generally makes its appearance in a very gradual manner; the patient after complaining for some time of more or less langour, loss of appetite, headache and pains in the limbs and back, is seized with slight coldness of the extremities, or frequently recurring chilly sensations, followed by a mild grade of fever, in which the *remissions* and *exacerbations*, if noticeable at all, are irregular or exceedingly obscure, attended with thirst, quick tense pulse, sallow or darkly flushed cheeks, and high colored urine. At an early period of the attack there is more or less dullness of the mind, amounting in some cases to mild delirium, attended frequently with slight subsultus tendinum, or occasional epistaxis. The tongue, at first moist, is frequently *red around the edges*, and covered with a white or brown fur; as the disease progresses it gradually becomes dry, cracked, and finally not unfrequently presents a clean appearance. The bowels, although frequently regular, sometimes becomes loose; the stools being watery, of a dark yellow, or muddy appearance, and very offensive. After the persistence of these symptoms for eight or ten days, if the disease does not clearly assume the remissional type, or terminate in death within the same period, from violent engorgement or inflammation, it gradually loses its acuteness, and begins to present the

symptoms already detailed as characteristic of the continued stage of remittent fever.

Treatment.—If we grant that the long and continued operation of the remote cause is such as to produce in the system the pathological condition that gives to this variety of fever, from the commencement, the continued type, as a matter of course the first and most clear indication to be fulfilled, in its proper treatment, is to restore the secretions, and break up and remove the local *hyperæmias*, that probably, under the circumstances, are the *proximate* cause of the particular *type* it presents. For this purpose we give eight or ten grains of calomel in combination with a quarter of a grain of the acetate of morphine; this quantity of calomel and morphine we repeat about every four hours, according to the amount of hepatic derangement present, until two or three portions are given. At the end of twelve or fifteen hours after the administration of the last one of these powders, if the bowels are not sufficiently moved, we give a dose of castor oil. After the operation of the oil we then commence and give five or six grains of quinine at midnight, at daylight, and at ten o'clock the next morning; this we repeat the next night and succeeding morning as above. If we now find the tongue improving, and the fever abating, which we frequently do, we complete the cure by the continuance of the quinine a few days longer; but, on the contrary, should the tongue remain furred, and the febrile symptoms but little, or not at all abated, we repeat the calomel and morphine powders again, at perhaps a little longer interval between each dose, taking care not to carry them off after the administration of the last one, with oil, or any other laxative, sooner than eighteen or twenty hours. If the calomel thus given brings off free, consistent, bilious (tarry) discharges, we can then generally within the next twenty-four hours bring the system under the influence of the quinine, and abate the fever.

In the management of cases attended with a loose state of the bowels, or with local determinations, we endeavor to restrain the bowels with anodynes and astringents, of which opium and tannin, as a general rule, are probably the best. The opium we give in sufficient doses to restrain the action of the bowels as much as possible without producing too much stupor. Where there is much tenderness on pressure over the stomach and

bowels, sinapisms and warm poultices, and if there is inflammation, cups and blisters over the suffering organs, are not only useful, but actually necessary.

The fact that our distinguished and lamented friend, Dr. Boling, entirely failed to cure the mildest case of *continued fever*, by the successive daily administration of from thirty-six to forty grains of quinine;* no less than that our patients have generally and within a very reasonable length of time thoroughly recovered: has caused us, as yet, to feel no disposition whatever to change our plan of treatment: but knowing in some cases, and under certain circumstances, how difficult it is, from idiosyncrasy, or the former abuse of mercury, to administer calomel and opium in this variety of fever, so as to procure its proper curative effect, without occasionally ptyalizing our patient, we recommend to those of our professional brethren, who believe that in the early stages of *continued fever*, if febrile excitement be *quenched* and *kept under*, by the liberal administration of quinine, that the *unaided powers* of the *system* are competent to a *cure*, a trial of the thirty grain doses of quinine in combination with one or two grains of opium, as recommended and practiced by Dr. Fenner, of New Orleans.†

Congestive Fever—*The Congestive stage of Intermittent and Remittent Fever*.—After a long and careful study of the causes, seats, symptoms, anatomical characters and treatment of congestive fever, we have been brought to the conclusion that probably the chief cause of the disagreement in opinion amongst medical writers upon the subject of its proper classification, is perhaps more the result of the want of a proper phrase to express the true condition present in the chill than anything else. If our medical brethren could be brought to fully realize the fact, that there is present more or less *congestion* in every grade and variety of ague, and that it is the most prominent, if not the most dangerous symptom in the cold stage of an intermittent that terminates in death during the first, second,

* New Orleans Medical and Surgical Journal, July ~~November~~^{Mo}, 1852, page 1, also a review of this paper by the writer, contained in the September Number, 1852, of the same Journal, page 255.

† New Orleans Medical and Surgical Journal, November Number, 1852, page 318.

or any other paroxysm; and that what is familiarly known amongst us as a *congestive chill*, is nothing more than a prolongation, or perhaps, deepening of this stage, and that remittents, during their course, sometimes fall into a similar condition. We think they would experience but very little trouble in arriving at a correct understanding of the true nature and proper treatment of this stage of fever.

In an Essay on the *distinctive character* of congestive fever, Dr. Silas Ames* denies its identity with the pernicious fever of Dr. Wood, on account of the want of uniformity in their *post mortem* lesions, and with the malignant intermittents and remittents of other writers, upon the ground that the latter preserve throughout their paroxysms, the several (cold, hot and sweating) stages of a simple intermittent. Entertaining, as we do, the highest respect for the character and memory of Dr. Ames, it is really a source of no small regret to have to differ with him upon any subject; more particularly upon one in which his experience could not have been otherwise than ample; nevertheless we are, at least for the present, unwilling to admit that the *absence* of inflammation in any of the tissues or organs of the bodies of those who die in the first or second chill, or the presence during life of some symptoms in the paroxysms of an *intermittent* or *remittent* fever, that are absent in others, proves any *non-identity* whatever between them, and the congestive stage of fever.

Under the head of congestive fever, Dr. S. H. Dickson,† while refusing to admit there is any variety of fever to which this title is exclusively appropriate, (in compliance with what he considers custom among American writers, who thus designate a particular class,) describes a periodical form of intermittent and remittent fever, chiefly the latter, which he thinks if not identical with, at least resembles very much the malignant intermittents and remittents of the French and Italian writers.

Again, Dr. Drake‡ after describing simple and inflammatory intermittent fever, then comprehends the remaining varieties of

* New Orleans Medical and Surgical Journal, Nov., 1850, page 300.

† Elements of Medicine, pages 258--9.

‡ Principal Diseases of the Great Valley North America, Vol. 2, page 71.

this type, not referable to these two heads, in which the reaction and remission are feeble and imperfect, and the regularity of the other symptoms mingled or wanting, under that of malignant intermittent. He also further informs us (pages 114 and 115) that in malignant remittent fever, there is not only present great congestion in the *vena cava* and its branches, but there also exists a broken balance in the circulation, and that the organs most oppressed become the seats of special irritation and congestion. When these local inflammatory engorgements fail to produce reaction, as they sometimes do, we have present every element of danger and difficulty, together with a concurrence of symptoms of a highly adynamic and ataxic character, from which the patient will be recovered with difficulty.

In some localities in the Southern and South-western States, those in which during the summer and fall months malarial fevers of every grade and variety prevail, we occasionally meet, in the second or third paroxysm of remittent fever, with a weak, frequent and variable pulse, attended with increased gastric irritability, restlessness and thirst. These symptoms, generally denominated by medical writers malignant or pernicious, are really nothing more than the premonitory signs of an approaching cold stage, and the manifest result alone of congestion. In other cases the congestion falls more particularly on some one or more of the principal organs of the body, as the brain, lungs, liver, spleen, stomach, or bowels, and is accompanied in every instance by the peculiar symptoms characteristic of *hyperæmia* of these organs. These local determinations during the course of the primary fever, have been, we think, very improperly described by medical writers—as the comatose, soporose, thoracic and abdominal varieties of congestive fever. In other low, moist localities, where the long absorption of malaria has destroyed the vitality of the blood, turned it black, and rendered it incapable of stimulating the heart into reaction, the *congestive* stage is neither so mild or gradual in its approach, the patient frequently *dying* in the *first chill*. These necræmial cases (in which there is no fever) occurring in places and at times in which the endemic causes are intense and concentrated, are very well described by Drs. Forry,* Lewis,† Hort,‡ and others; but as they are of rare occurrence, and

* Climate of the United States, page 587. † Medical History of Alabama, page—. ‡ New Orleans Med. and Surg. Journal, Vol. IV, July 1847, page 56.

almost universally fatal, they cannot, we think, with propriety, be viewed in any other light than aggravated cases (instances) of the congestive stage, and in which the power of reaction is completely overwhelmed—destroyed.

From an examination of the preceding synoptical extracts, it appears that while some of the writers cited, contend for a congestive fever, *ab initio*, others no less experienced deny its existence altogether, or describe a similar condition of the system under the name of malignant intermittent, remittent, or pernicious fever. The want of respect on the part of Dr. Drake|| for the congestive theory, the advocates of which he *derisively* styles hydraulic or mechanical pathologists, no less than the difficulty experienced by some of the others in the transformation of mere symptoms into an idiopathic disease, is probably to some extent the cause of difference among them. Hence the classification by systematic writers upon congestive fevers, into the cerebral, thoracic and abdominal forms, with sometimes a sub-division of these into varieties, we feel constrained to reject upon the grounds just stated, that the original disease of which they are described as mere species, varieties and sub-divisions, is itself nothing more than a *symptom, a stage of periodic malarial fever, and should be described and treated as such.*

Treatment.—To meet all the indications this must be preventive, in the chill, and during the remission. In an attack of either intermittent or remittent fever, should any of the symptoms present themselves heretofore mentioned as premonitory of the approach of the congestive stage, we must endeavor to bring the system of our patient under the influence of quinine and opium, before the expected return of the next paroxysm. This may generally be effected by the administration, every two or three hours, of from four to six grains of quinine, and half a grain of opium, or its equivalent of morphine, until from twenty to thirty grains of the former are taken. Sometimes, in combination with each dose of quinine and opium, we give from three to five grains of pulverized cayenne pepper, directing the patient at the same time to drink pretty freely of a tea of this article, and to apply a mustard poultice to the

|| Principal Diseases Miss. Val. of North America, Vol. II, page 114.

epigastrium. This course I have generally found *efficient* to prevent the development of the *congestive* stage. Afterwards, if there is present much hepatic derangement, which is frequently the case, I give some three or four pills (one every two hours,) composed of two or three grains each of calomel and blue-mass, to be followed, if necessary, with oil; and then complete the cure by giving, for two or three days longer, more quinine, gradually reducing the quantity each day.

Dr. Horatio N. Morris and myself, in the fall of the year 1835, in the case of a young gentleman at the "Planter's Hotel" in this city (Wetumpka,) in the congestive stage of an intermittent fever, gave him, during the course of the afternoon, some eighty or ninety grains of quinine, with as much brandy and opium as we thought prudent; at the same time applying mustard plasters to his spine, epigastrium and extremities. Yet our patient gradually grew colder and weaker, and finally, before midnight expired. This case, together with several others that came under our observation within the next five or six years, in which large quantities of quinine, aided by the external application and internal administration of the most powerful stimulants failed to produce the least reaction, led us not only to doubt the curative powers of large doses of quinine, in this particular condition of the system, but to suspect that they might have had something to do in bringing about the fatal result. About this time, and when greatly discouraged in trying to fix upon some better plan of treating the congestive stage of fever, we received from our friend, Dr. Baldwin, of Montgomery, his essay on the poisonous properties of the sulphate of quinine.* After a thorough study of this essay; a few rays of light began to illuminate the darkness by which we were surrounded, confirming our previous suspicions, and leading us irresistibly to the conclusion that from twenty to thirty-six grains of pure quinine would produce that particular condition of the system, recognized by us all as "*quininism, a state of irritation and excitement.*" † that carried beyond this point, it would begin to display its *sedative* powers, and perhaps a little further, its *poisonous properties*. Ever since then, now some twenty odd years ago, we have never doubted that large doses of this remedy in

*American Journal of the Medical Sciences, April Number, 1847.

† Elements of Medicine, Revised Edition, p. 262.

stages of depression, (no matter what may be its action in other conditions of the system) would produce dangerous symptoms, if not death, and consequently have *discontinued its use in large doses during the chill*. The plan we now pursue in the chill, is to apply immediately over the epigastric region a large blister, six by eight, or eight by ten inches, letting it remain on from eight to ten hours, or until it draws thoroughly. If we have any fears from the coldness or want of vitality in the skin, that the blister may not draw promptly, we endeavor to irritate the surface with mustard or spirits of turpentine. This done we then give one of the following pills: quinine, 2 grains; Calomel, 1 grain; oil of black pepper, one drop; camphor half a grain, and opium, $\frac{1}{4}$ grain, every two hours through the congestive stage, and continue them until the patient has passed beyond the period for the return of the next paroxysm; which will be in from twenty-four to thirty-six hours, according to the type (tertian or double tertian) of the prevailing fevers of the locality. During the remission, if the pills have not acted we give a little oil, or some other mild laxative; and then continue to treat the case, but rather carefully, as an ordinary intermittent or remittent fever.

Having in the preceding pages (part first) shown in localities from near the level of the ocean, to upwards of 6000 feet above its surface, in which there was moisture and organic materials in certain proportions, under a high temperature, the continued prevalence of malarial fever, and in others with equally as high a temperature, but without either moisture or organic materials in sufficient amount, or proper proportions, its continued absence, we will now in the further investigation of the *essential nature of its remote efficient cause*, endeavor to show more clearly perhaps in the sequel than otherwise, by the introduction of a medico-topographical and meteorological account of one of the most unhealthy regions in the world, that while malarial fever cannot with any degree of propriety whatever, be ascribed to *living organic forms*, (the vegeto-animalcular hypothesis;) *malaria* cannot be anything other than a *gaseous element*, the result alone of the combination of the *elements of decomposing dead organic materials*. For this purpose we know of nothing to compare with the materials contained in the official report of Lt. W. F.

Lynch, of his exploration in, and around the Dead Sea, made to the Secretary of the Navy of the United States in July, 1849. These materials, the collection of which were commenced under the most discouraging circumstances, and carried out at the peril of the life of himself and companions,* are we think somewhat enhanced in value from the fact that they were collected and reported by one who made no pretensions whatever to medical acquirements, and who therefore had no preconceived medical theories to warp his report in support of; therefore, when we are told by this truly good man, that there could be nothing *pestilential* in the atmosphere of the sea, there being but little verdure upon its shores, and, by consequence, but little vegetable decomposition to render its air impure, we ascribe the assertion to the fact above alluded to, and which rendered him badly qualified to determine what were really elements and circumstances necessary for the production of disease. In support of this opinion we herewith submit from his *report* and *narrative*, the following carefully compiled abstract, and in so doing cannot refrain from the expression of the opinion, that the account, as a whole, from which it is made, either as regards accuracy of detail or elegance of style, will, perhaps, never be equalled, and must forever remain a memorial monument to the courage and genius of its author: "This sea, together with the whole valley of the Jordan, we are informed, has probably sunk down some 1300 feet below their original level, with the gratest depression abreast of Wady *Ghuwier*; and that the streams which formerly ran through to the Red Sea were thereby debarred an outlet, and submerged the plain, the cities of which from the abundance of *bitumen* found in and around its shores, were most probably the theatre of a preceding *conflagration*." The opinion that the Vale of Siddin was thus submerged is, we think, very strongly supported by the fact that the soundings made ascertained the bottom of the sea to consist of two plains, an elevated and a depressed one, averaging the former thirteen feet, and the latter thirteen hundred feet below its surface; through the northern and largest and deepest one runs a ravine, which seems to correspond with the bed of the Jordan to the north, and with another one at the southern extremity of the sea. Leaving here,

* The party consisted of Lt. Lynch and fifteen others.

however, the study of this part of the report and narrative to those who may feel, (and doubtless there are many,) an interest in such matters, we will now describe the Dead Sea and its shores; but before proceeding to do so, will merely observe that from lake Tiberias to its confluence, the course of the Jordan, although extremely crooked, is nearly due south, and that at its mouth, according to the season of the year, varies in width from 180 yards, and three feet in depth, to probably a very small stream.*

Medical Topography of the Dead Sea.—This sea, extending down upon the same meridian of longitude of that of the river Jordan, $35^{\circ} 30'$ east, and lying entirely between the thirty-first and thirty-second parallels of north latitude, is described by Lieutenant Lynch, when undisturbed by winds, as a sheet of placid, salt, sulphurous water, of some forty-five miles in length, and varying in width from three to eleven miles. It is bounded on the north, north-west, and west, at no great distance from its shores, by the high, precipitous cliffs and mountains of Judea, and on the south-east and east by those of the lands of Moab and Ammon, and the recipient of the waters of the Jordan, the Arnon and the Warm Springs of Callirrhœ, through the Zerka Main, and which during the rainy season must be very large. The saltness and specific gravity of its water was found by experiment to be considerably greater than that of the Atlantic Ocean, and on analysis gave as solid constituents in certain proportions, the chloride of magnesium, sodium and calcium, and the chloride and bromide of potassium, with a small amount of sulphate of lime, *but failed under the most powerful microscope to show any animalcular, or vestige of animal matter.* Its temperature, as ascertained by a series of experiments made with a self-registering thermometer, was found to be at the surface 76° ; at the depth of 1,044 feet, 62° ; at the depth of (10 fathoms)

* In Palestine, there are, properly speaking, but two seasons, Winter and Summer, or the wet and dry; at Jerusalem, the annual average fall of rain amounts to nearly 62 inches, nine-tenths of which falls during the months of December, January, February and March; more copiously in February than any other month, although the rainy season is never marked by an entire cessation of rain at any time, yet there generally occurs an interval of several weeks of dry weather, between the middle of December and the middle of February. During the remaining seven or eight months, there is not even a single shower, scarcely a sprinkle. [See the City of the Great King, by J. T. Barclay, M. D., pages 55 and 417.]

sixty feet, there was an interruption to the gradual decrease of temperature by a stratum of cold water, the temperature of which was 99° . Below this stratum the gradual increase of temperature was thought (by Lieutenant Lynch,) to be attributable, perhaps, to the evolution of heat during the process of crystalization. Its water, as if mixed with milk, had the color of diluted *absinthe*; and over its surface hung continually throughout the day, and of various colors, being sometimes blue, purple, or yellow, a *thin mist, of evaporation*.

For the purpose of preventing any unnecessary confusion, we have thought proper, before entering on a topographical description of the shores, to state that the exploring party entered the sea through the mouth of the Jordan, on the evening of the 18th of April, 1848, and after encountering a heavy squall from the north-east, landed and encamped for the night at Ain el Feshkhah, on the north-western beach; they then continued their explorations around the north-western shore, to Ras el Feshkhah, and from thence along the western shore, to Ain Jidy. From this point, on the 24th of April, they crossed over to the eastern shore, and landed on the Peninsula; and after examining its shores, returned again the evening of the same day to the western shore; and from thence sailed around the western shore to Sebbeh, spending the night at Mubughghik; thence to Rash Hish and the extreme south point of Usdum and the sea; thence around the south-eastern shore, landing and encamping on the southern side of the Peninsula, near Wady Humeir; from this place, sounded across, and landed at Wady Mubariwat, on the south-western shore; passed up from this point, April 27th, keeping parallel with the western shore, and encamped for the night on a fine pebbly beach of a spacious bay at the foot of Rubtat el Jamus. From this point, returned to Ain Jidy, remained there through the 29th, and on the morning of the 30th, commenced operations by steering over to Point Costigan, and from thence in a S. S. east direction, landing and spending the night on the eastern shore, a short distance from a shallow stream descending the Wady Beni Hamed. May 1st, completed the topographical sketch of the shore lines of the bay, and verified the mouth of Wady Karah. May second, left the shores of the sea, and visited the walled town of Kerak, returning on the evening of the third

to the boats, launched the same, and all hands going aboard, steered down the bay, and landed and spent the night on the Delta, at the mouth of the river Arnon; from thence they coasted along the eastern shore, to the warm springs of Callirrhoe and the Zerka Main, from Callirrhoe, Lt. Lynch, crossed over to Ain Turabeh, sending Mr. Aulic with Dr. Anderson to complete the topography of the Arabian shore, and determine the position of the mouth of the Jordan. This done, they rejoined him at Ain Turabeh, where, after spending twenty-two days and nights upon this sea, they, on the morning of the 10th of May, took up their line of march for Jerusalem.

With this outline of the route of the party, marked on the accompanying map with red lines, we will be somewhat better prepared to understand the following topographical sketch of its shores. The northern shore is described as an *extensive mud flat*, with a sandy plain beyond, and the very type of desolation, having scattered over its surface in every direction the branches and trunks of trees, some charred and blackened as by fire—others white with an incrustation of salt; the north-western as an unmixed bed of gravel coming in a gradual slope from the mountains to the sea; and the eastern as a rugged line of mountains, bare of all vegetation, a continuation of the Hauran range coming from the north and extending south beyond the scope of vision, throwing out three marked and seemingly equi-distant promontories from its south-eastern extremity. Their first encampment was pitched in a *cane-brake*, beside a clear but brackish spring, with a strong and *suphurous* smell, and near a *fatid marsh*, the miasm from which was anything but agreeable. Between this point and Ain Jidy, the mountain sides and shores were almost void of vegetation, with the exception of a low narrow plain near Ras el Feshkhah, skirted with canes; from Ain Jidy to five or six miles north of the salt mountain of Usdum, with the exception of the cliff of Sebbeh, which is removed some distance from the margin of the sea by an intervening *delta* of land and detritus of more than two miles in width, there is but little variety in the scenery, and nothing in a medico-topographical point of view worth notice.

April 26.—Started and steered in a direct line for Ras Hish, the north point of Usdum, sounding every few minutes for the

ford, stretching out occasionally from the shore line and returning to it again when the water deepened to two fathoms. At 8.12, stood in, and landed on the extreme point of Usdum. Many dead bushes along the shore which are encrusted with salt, as at the peninsula; found it a broad, flat, marshy delta, the soil coated with salt and bitumen, and yielding to the foot.*

At 8.30, started again, and steered east S. east, sounding every five minutes, the depth from one to one and three-quarter fathoms; white and *black slime and mud*. At 9, the water shoaling, hauled more off shore; soon after, discovering a lofty round pillar, supposed to be the identical one into which Lot's wife was transformed for her disobedience, we immediately pulled in shore and landed for the purpose of examining it. We found the beach a *soft slimy mud*, encrusted with salt, and a short distance from the water covered with saline fragments, and flakes of bitumen.

† “Intending to examine the south end of the sea, and then proceed over to the eastern shore, in the hope of finding water, we discharged all our Arabs but one, and sharing our small store of water with them, and giving them provisions, we started again, steering south.”

“11.28. Unable to proceed any further south, from shallowness of the water, having run into six inches, and the boats' keels stirring up the mud. The Fanny Skinner, having less draught, was able to get a little nearer the shore, but grounded three hundred yards off. Lt. Dale landed to observe for the latitude; his feet sank first through a layer of *slimy mud* a foot deep, then through a *crust of salt*, and then another foot of *mud*, before reaching a firm bottom; the beach was so *hot* as to *blister his feet*. From the water's edge, he made his way with difficulty for more than a hundred yards over *black mud*, coated with salt and bitumen.”

‡ “The Southern shore presented a mud flat which is terminated by the high hills bounding the shore to the southward. A very *extensive plain, or delta, low and marshy*, towards the sea, but rising gently, and farther back, covered with luxuriant green, is the outlet of Wady el Safish. Anxious to examine it,

* Narrative of the Expedition, page 173-4, 2 Ibid., page 201.

† Narrative of the Expedition, page 203.

‡ Ibid, page 204.

we coasted along, just keeping the boat afloat, the inshore oars stirring up the mud. The shore was full three-fourths of a mile distant, the line of demarkation scarce perceptible, from the stillness of the water, and the smooth, shining surface of the *marsh*. On the flat beyond were lines of drift wood, and here and there in the shallow waters, branches of dead trees, which like those at the Peninsula, were coated with saline incrustations. The bottom was so very soft that it yielded to everything, and at each cast the sounding lead sank deep into, and brought up a soft, marshy, light-colored mud.

It was indeed a scene of unmitigated desolation; on one side rugged and worn, was the salt mountain of Usdum, with its conspicuous pillar, which reminded us at least of the catastrophe of the Plain; on the other, were the lofty, barren cliffs of Moab, in one of the caves of which the fugitive, Lot, found shelter. To the South was an extensive flat intersected by sluggish drains, with the high hills of Edom semi-girding the salt plain, where the Israelites repeatedly overthrew their enemies, and to the north was the calm and motionless sea—curtained with a *purple mist*—while many fathoms deep in the slimy mud beneath it lay imbedded the ruins of the ill-fated cities of Sodom and Gomorrah. The glare of light was blinding to the eye, and the atmosphere difficult of respiration. No bird fanned with its wing the attenuated air through which the sun poured his scorching rays upon the mysterious element on which we floated, *and which alone of all the works of its Maker, contains no living thing within it.*"

"11.28. In two hours we were close in with the eastern shore, but unable to land, from the soft bottom and shoalness of the water; at 2:50, a light breeze from west north-west, hauled to the north, towards the base of the Peninsula. A long narrow, dry marsh, with a few scrubby bushes, separated the water from a range of stupendous hills two thousand feet high. Steering along a *low marshy flat*, we landed on the south side of Wady Humeir, the most desolate spot upon which we had yet encamped."

Opposite the mouth of the Wady Beni Hamed is quite an extended plain, having scattered over it groves of acacia, tamarisk and other trees, and on which were found growing millet, tobacco and some indigo. On this plain stands the town of

Mezraah, in the near vicinity of which are found the supposed ruins of Zoar.

Besides the *deltas* at the mouths of the different streams and ravines, and the stagnant pools of water on the northern shore may be mentioned the three small *post Pliocene* or *Alluvium islands* within, and at the mouth of the Jordan, and which are subject to overflow.

Plants, fruits, flowers, grasses, grain and trees, found growing in the immediate vicinity, and on the shores of the sea. Near Ain Turabeh, were found the lily, the yellow henbane, the nightshade, the lambs quarter, and a species of kale. On the plain near Ain Jidy, the rock rose, the common pink, the alleppo senna, the common mallow, and yellow migniotte; on the upper part of the plain, near Wady Sudier, the prickly gherkin, and two patches of barley, and near the north-west of Usdum a melon, resembling a cantelope, and very bitter. Canes and grasses—the former at many places along the shore, and particularly at the mouths and along the banks of the different rivers and ravines. The dhome or spina christa and its fruit, resembling a dried crab-apple; the fountain of Ain Jidy is concealed in a grove of these. The pistachia, the tamarisk, the acacia, the osher, and ghurrah, together with a few willows at the mouth and along the shores of the Zerka Main.

Now, when we take into consideration, in connection with the foregoing account, the fact that the rivers Jordan and Arnon and the brook Zerka Main, are continually discharging through their waters into this great reservoir in various stages of decomposition, large quantities of organic sedimentary materials, and that from the action of a central current that has always been observed setting south, they are carried and deposited along its northern shore and at its southern extremity, we ought not to be surprised at its great *insalubrity*, when we recollect that the constant and powerful *evaporation* consequent upon the *dry season*,* there is always presented to the action of the sun around its shores, but more particularly at its *northern* and *southern extremities*, a surface varying from a few hundred yards to miles in extent, filled with these organic materials, under the

* Lt. Lynch informs us that before himself and party left, it had fallen from evaporation about seven feet.

most favorable circumstances, a *high temperature and sufficient moisture for the evolution of vast quantities of the most concentrated malaria.*

Meteorology.—Barometer.—This instrument near the upper end of the sea, indicated an atmospheric pressure of 29.93 inches at Wady Sudier; a little south of Ain Jidy, ~~30.08~~ inches; but feeling more deeply interested in the oscillations of the atmosphere at the same level than its mean pressure at different elevations, accordingly we find these, as given by Lieut. Lynch, ranging from 29.998 to 30.129 inches, with a gradual diminution in elevation and oscillation as he approached the heated and rarified atmosphere at the southern extremity of the sea.

Temperature.—The thermometer, we are informed, ranged during the day, in the shade, from 79° to 110°, never falling through the night below 68°; and on but one occasion, near the upper end of the sea during a clear and calm night, as low as this point. The highest temperature experienced was from the first to the tenth of May, during the explorations around the southern shores of the sea; the temperature varying here in the shade from 80° to 110°, and never sinking during the night below 74°.

Dew and the Dew-point.—Upon this subject we are informed that “although the nights were mostly cloudless, there was scarcely any deposit of dew, the ground remaining heated through the night from the intensity of the solar rays during the day. On the first of May, although the wind was high—too high to take observations—the night was sultry, thermometer 81°, and the dew so heavy as to filter through the tent awnings, and drop upon our faces.” This is noted as the second time that dew had been observed, and each time it had been attended with a *hot wind from the North*; the first time it was succeeded by a *sirocco*, and the last by a *thunder storm*. For the deposition of dew we know that the atmosphere must be either charged to saturation by evaporation, or cooled down to condensation; and although we have no account of its having been charged to saturation more than twice, we have every reason to believe that during the frequent calms from the rapid evaporation that was continually going on from the surface of

30.08

the sea, that the circum-ambient air, must have been loaded with watery vapor, the deposition of which as dew, was prevented by the frequent *hot, dry winds from the west, south, and south-east.*

Winds.—These were evidently of two kinds, local and general; that the former were no less the result of inequalities in the temperature of the air of the two extremities of the sea, than were the latter of similar causes, on a more extended scale, we have an abundance of evidence; hence, by the rarified columns ascending at the south, currents of warm, moist air were set in motion from the north; but of an entirely different character from the general ones blowing from the same direction, and coming from the snow-capped summit of Mount Hermon and the Lebanon ranges. Up to April 23d, each day, in the forenoon, the wind had prevailed from the *southward*, and in the afternoon, until about midnight, from the *northward*. The last wind quite fresh, and accompanied with a *smell of sulphur*; after midnight it generally fell calm.

The general winds that came from the north and north-west, over the sterile plains of Judea, and those from the south, over the desert of Zin, were as completely robbed of their moisture as those that came from the south-east and east across the great deserts of Syria and Arabia, and over the barren plains and calcined cliffs of Moab and Ammon. These hot, dry winds were always unrefreshing, and from their high dew-point must have been exceedingly unhealthy. The approach and effects of a sirocco, at the southern extremity of the sea, is thus described: "Clouds in the east, nimbus seemed to be threatening a gust; presently the light wind subsided, and it became oppressively hot; air 97° ; water twelve inches below the surface, 90° ; a thin purple haze over the mountains, increasing every moment and presenting a most singular and awful appearance; the haze so thin it was transparent, and rather a blush than a distinct color. Apprehending a thunder gust or an earthquake, we took in sail. At 3.50, a hot, blistering hurricane struck us from the south-east, and for some moments we feared being driven out to sea. The thermometer rose immediately to 102° —the men closing their eyes to shield them from the fiery blast, were obliged to pull with all their might to stem the rising waves,

and at 4.30 physically exhausted, but with grateful hearts we gained the shore; my own eyelids were blistered by the hot wind, being unable to protect them from the necessity of steering the boat. After landing, one man mounted spectacles to protect his eyes; but the metal became so heated that he was obliged to remove them. Our arms, and the buttons on our coats, became almost burning to the touch; and the inner folds of our garments were cooler than those exposed to the immediate contact of the wind." Shortly after the subsidence of this sirocco, saw appearances of sand pits on the surface of the sea; doubtless the optical illusion which has so often led travelers to mistake them for islands. On the next day from the same cause, the great *refraction* of the atmosphere, the Fanny Skinner, around the point, seemed elevated above it. Her whole frame, from the surface of the water, was distinctly visible, although the land intervened.

Having now concluded all that is necessary to be said in relation to the medical topography and meteorology of this most remarkable locality, we come next to inquire what were the immediate and subsequent effects upon the health of those exposed to its vapors and atmospheric variations. Upon this subject we are informed by Lieutenant Lynch that there is a tradition among the Arabs that no one can venture upon its waters and live, and that repeatedly were the fates of Costigan and Molyneux cited to deter him from the undertaking. Undismayed, however, by these reports, and knowing no other object than the faithful execution of his orders, fearlessly himself and party at once launched upon its waters, and although we are told that there had been symptoms that had caused him some uneasiness, still up to the 30th of April, all, with one exception, had enjoyed good health.* "About this time, the figure of each one had assumed a dropsical appearance, the lean had become stout, and the stout almost corpulent; the pale faces had become florid, and those which were florid, ruddy; moreover, the slightest scratch festered, and the bodies of many of the party were covered with small pustules, all had good *appetites*, and these sores were evidently the result of the greasy, acrid water of the sea; shortly after this, and while the party were asleep, we

* Narrative of the Expedition, pages 218-9.

have the following description of their condition: My companions had yielded to an oppressive drowsiness, and lay before me in every attitude, of a sleep that had more of stupor in it than repose. Some with their bodies bent, and arms dangling over the abandoned oars," their hands excoriated with the acrid water, slept profoundly; others with heads thrown back and lips cracked, and sore, with a scarlet flush on either cheek, seemed overpowered with heat and weariness, even in sleep; while some upon whose faces shone the reflected light from the water, looked ghastly, and dozed with a nervous twitching of the limbs, and now and then starting from their sleeps, drank deeply from a breaker, and sunk back again to lethargy;* subsequently (but after leaving the immediate shore of the sea) every one of the party, with the exception of seaman George Overstock, who on returning to the mouth of the Arnon after exploring the southern shores of the sea, on the night of the 3d May, under the influence of a cold north-west wind, had a chill, and was sent the next morning to the Convent of Mar Saba, were attacked with a fever of a low nervous grade, attended with great exhaustion and partial delirium, the same that carried off Costigan and Molyneux, and of which Lieutenant Dale unfortunately died. We are also informed that of the three thousand Egyptians sent to the shores of the sea, by Ibrahim Pasha, some time during the year 1838, for the purpose of making a settlement, every one of them died within two months after their arrival.†

Effects of the foregoing facts, as regards the origin of Fever, upon the Animalcular, Vegeto animalcular or Cryptogamous Hypothesis. Aware that it is contended for by philosophers, that the class of infusoria, prove life generally diffused, and what under the most powerful magnifying glasses, almost all fluids and even earths and stones, are shown to possess more or less of it; still, as no animalculæ, or vestige of animal matter could be detected by the most powerful microscope in the waters of the Dead Sea, renders it highly probable, nay, almost certain, that nothing of the sort did exist there, either in the mud and slime along its shores, or anywhere else, within the influence of its *life-destroying properties*. Hence the vegetable matters entangled with the mud, washed down from the surrounding countries of the dif-

* See Narrative of the Expedition, pages 220-1.

† Ibid 219.

ferent streams, and supposed to contain animalcular life, must have had every vestige of vitality thus destroyed long before reaching and being deposited at its Southern extremity, and along its shores—thus furnishing evidence of the fallacy of the doctrine, alike conclusive, either as regards the animalcular or vegeto-animalcular origin of fever. As regards the other hypothesis, we are informed by Dr. Mitchell, in his essay on the Cryptogamous Origin of Malarious Fever, that “just on the line which faintly marks the division between the animal and vegetable kingdoms, lie the lichens, the algæ, and the fungi: these cryptogamous plants are so closely allied to each other, as to be indistinctly separated by naturalists, some of whom include under one division, species, which are found differently disposed of by other phytologists. Lindley following the great continental cryptogamists, admits that the location, rather than the structure of these plants, affords a final distinction, and that while the lichens live on dry and scanty soils, and algæ in water, salt or fresh, the fungi occupy the intermediate place, loving a damp and unsound or loaded atmosphere, and feeding on organized matter, the vitality of which is gone or going.

In all of them, the element is a very minute cell, not often distinguishable, when isolated, from the elementary cells of even animal organisms; indeed some of the confervæ, obviously vegetable in one state of existence, as the anthrodia, offer in another the plainest character of animal life, supposing that animal life is to be inferred from motions indicating a well-marked power of volition. Some of the oscillaries have oscillatory movements extremely active and perceptible, and the *ulva labyrinthi formis* an *anabinæ*, with all the other conditions of a vegetable, have, according to Vanquelin and Chaptal, all the chemical characters of an animal. We have, therefore, chemically constituted plants with animal motion and volition; and those of the animal composition, with the exclusive habitudes and structure of vegetables. Now, as regards the animal motions and volitions of the first class, and animal composition of the second, the facts already stated are perfectly fatal, as nothing of the sort could exist, within the waters, or on the immediate shores of the sea. In fact Dr. Mitchell, in the work from which the foregoing extracts are made* in his search for

* Essay on Fever, pages 34-35.

a new cause of malarial fever, seems to have entirely forgotten that the handfuls of dust, which he picked up whilst standing at St. George's, Delaware, filled with the spores of what he supposed to be the polyporus destructor, and merulius vastator, cryptogamus plants, whose active existence had been bought at the expense of the old stumps, might have already, or even then, under well established chemical laws, been disengaging into the surrounding atmosphere a gas, the cause of all the previous mischief. That such a result as this would have been nothing but natural, will to the student of nature, not appear very strange when he learns that a law once established forever remains, operating always upon the same general principles, and forever producing similar results; and that attraction and gravitation are no more illustrations of an original law than is Malaria under certain circumstances the result of vegetable matter undergoing decomposition, and that the one is as susceptible of proof as the other.

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