Miss D. L. Dix
with best respects of
the Author

CHOLERA,

WITH REFERENCE TO THE GEOLOGICAL THEORY:

A PROXIMATE CAUSE——A LAW BY WHICH IT IS GOVERNED——

A PROPHYLACTIC.

BY JOHN LEA.

Nihil scriptum miraculi causa.—Tac.

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WRIGHT, FERRIS & CO., GAZETTE OFFICE.
CINCINNATI, APRIL, 1850.

Lea (J.)

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CHOLERA,

WITH REFERENCE TO THE GEOLOGICAL THEORY.

WITHIN the last two years, I have published through the medium of the city press, and by letters addressed to individuals, in this country and in Europe, (who I thought would aid promptly in the investigation of so important a subject,) certain facts and observations respecting a *proximate cause* of that much dreaded disease, the "*Asiatic Cholera*;" but my communications have met with little favor—the thing is *too simple*—the mystic theories of *ozone*, *zumosis*, *fungi*, &c. are better adapted to the prevailing taste for the marvelous: few seem willing to believe that the water which they are accustomed to drink, may so unite with certain miasmata, afloat in the air we breathe, as to produce the most deadly effects! but *it is even so!* The enemy has been at our doors; he has surrounded us; he has thrown the pall of death over us! and it will now be manifest to all who will take the trouble to investigate, that he has *system* in his work! *method* in his onslaught, and method in his career of destruction! and is governed like all other natural phenomena; by *laws immutable, unchangeable!*

Twenty years have now passed away since I had wellnigh become the victim of an attack by *cholera morbus*, in consequence of passing from a region of arenaceous and alluvial formation, (West Tennessee,) to one of lime-stone, *blue silurian*, (Nashville.) At that time (1830) the *Asiatic cholera* had not made its appearance on this continent: it commenced its ravages in 1832. I then perceived that it passed around the *arenaceous*, and spent its fury on the *calcareous* regions; and it occurred to me that, as calcareous water had caused a violent attack of the cholera morbus, (so called,) and its congener, the Asiatic cholera, attacked with deadly effect *those who used the same water*, while it *passed by* those who used *sand-stone*, or soft water, that the *calcareous water* was a *proximate cause* of that disease. This idea was communicated at the time to several medical gentlemen, but met with little favor: the disease never

troubled us in *that region*, and the subject laid dormant in my mind until its reappearance in Europe, two years since.

The apprehension that this strange and malignant epidemic would revisit us, induced me to examine into the truth of the theory I had formed—now known as the *Geological Theory*; and the result has proved most satisfactory for the interests of humanity, and exceeded my most sanguine expectations.

Dr. Jenner's discovery of vaccination, as a preventive of the small-pox, was the subject of unbounded ridicule: he was carricatured as a man with cow's horns on his head, giving *beastly* diseases to mankind! the *bipeds* derided—lampooned him; and it was *twenty years* before he could get his discovery adopted into *hospital practice!* However he succeeded at last,—yet to this day it is not *universally* adopted; and now, to say that 100,000 lives are saved by it annually, is probably greatly under the mark, to say nothing of the *suffering* caused by that loathsome and painful disease. The Dr. was at last rewarded by a grant from the British Government of £20,000.

I found on inquiry, that the cholera had shunned all the arenaceous, alluvial, and primary formations in the Union, except those watered by wells or rivers, holding in solution calcareo-magnesian elements. The sea-board of the States of North and South Carolina, Georgia, Florida, and Alabama, comprising a portion of the most insalubrious country in the United States, escaped the disease; so likewise West Tennessee; Emmetsburg and its vicinity, in Maryland; West Point, Nantucket, and New England generally. All those localities *escaped again* last summer, (1849,) and likewise all others *similarly situated.*

It may be asked why New York and Boston should have suffered, the former being based upon gneiss, the latter upon granite. I answer—both those cities are to a certain extent—perhaps three fourths—provided with excellent water; but the *well water* of Boston, as also that of New York, contains various salts. A gallon from the *Manhattan well*, on analysis, was found to contain,—

Muriate of Soda, ...	42.20
" " Magnesia, ...	40.00
Sulphate of "	6.00
Carbonate of Lime and Magnesia,	12.80
Sulphate of Lime, ...	4.00
Extractive matter, ...	17.80
	gr. 122.80

This is bad enough, certainly. It is presumable that many persons still use this impure well water in those cities, they not being supplied with that of the Croton, or Cochituate. The deaths in Boston (1849) from cholera, were about 600: of these about 450 were foreigners, leav-

ing but 150 of the native citizens to have suffered, out of a population of upwards of 120,000; and of this number many may have used the well water; some had chronic bowel complaints, others doses of *magnesia*, (which sometimes causes rice-water discharges in an hour,) and *acid fruits*, and *crude vegetables*, prove a powerful auxiliary to the malignant poison with which the air is infected. So difficult was it for the disease to make a *lodgment* in Boston in 1832, (few emigrants then,) that "in a fortnight after its appearance, it had numbered but four victims, and about forty fatal cases altogether occurred." *Bost. Med. Mag. vol.* 1. It degenerated in the vicinity at that time to a mere *cholerine*, and "of 118 cases at the State Prison, not one died." *Ency, Amer.*

New York suffered more in proportion to its population than Boston, but it had a far larger proportion of immigrants, many of whom, though Asiatic cholera be extinct, will fall victims to its congener, *cholera morbus*, by change of climate and food, exposure to great heat, &c.

Charleston requires no quarantine regulations to save it from the cholera. That disease has never prevailed there, although it is surrounded by a great extent of malarial country; so insalubrious is the latter deemed, that but few white people reside permanently therein. Why is Charleston exempt? Because, it being situated on alluvion, and no supply of water from rivers, the rain and wells afford that supply, which is free from mineral elements, at least those that stimulate the virus of cholera.

New Orleans suffers from cholera. This is owing to the use of the Mississippi water; those who use rain water there, do not die of the disease. Exceptions to this rule will be found very rare indeed.

Mobile is on the Mobile river, the water of which is brackish, and unfit for domestic use. The city is supplied with very pure *soft* water by an aqueduct from Springs at Sandy Hill, (six miles off.) Cholera has *never yet proved epidemic there*, notwithstanding its proximity to, and great intercourse with, New Orleans.

The mortality amongst the slaves on some of the sugar estates on the Mississippi was frightful. More than 100 have died on a single plantation! They used the river, or well water: the white families, who used the cistern, or *rain water*, did not suffer.

The water of the lower Mississippi, if drank alone, affects the bowels of strangers at all times, and during the prevalence of cholera is attended with the *most fatal consequences;* that of the *upper* Mississippi appears to be much less injurious. The towns above the mouth of the Missouri suffered but little in comparison with those on the latter river; therefore I infer that the water of the Missouri is a powerful provocative of cholera.

St. Louis is situated twenty miles below the mouth of the Missouri, on the same side. The pressure of the Upper Mississippi at the conflu-

ence of those great rivers, forces the former river on to the St. Louis side, and the muddy water of the Missouri does not unite with the clear water of the other river for many miles below that city. Thus it will appear that St. Louis is supplied with *Missouri water*, as far as the supply by the public works extends, and the rest of the city depends upon *wells*, which, being in the calcareo-magnesian formation, plainly accounts for the dreadful severity with which that city has been scourged; and to *this account* may be charged *the loss of so many children annually* by *bowel diseases*. St. Louis lost 1,493 children, under five years of age, from April 20 to Aug. 8, 1849, of all diseases.

Cincinnati and its vicinity furnish abundant proofs of the truth of the Geological Theory. This city contains about 100,000 inhabitants. The number of deaths by cholera, from May 1st to August 30th, 1849, was 4,114
All other diseases, ... 2,345

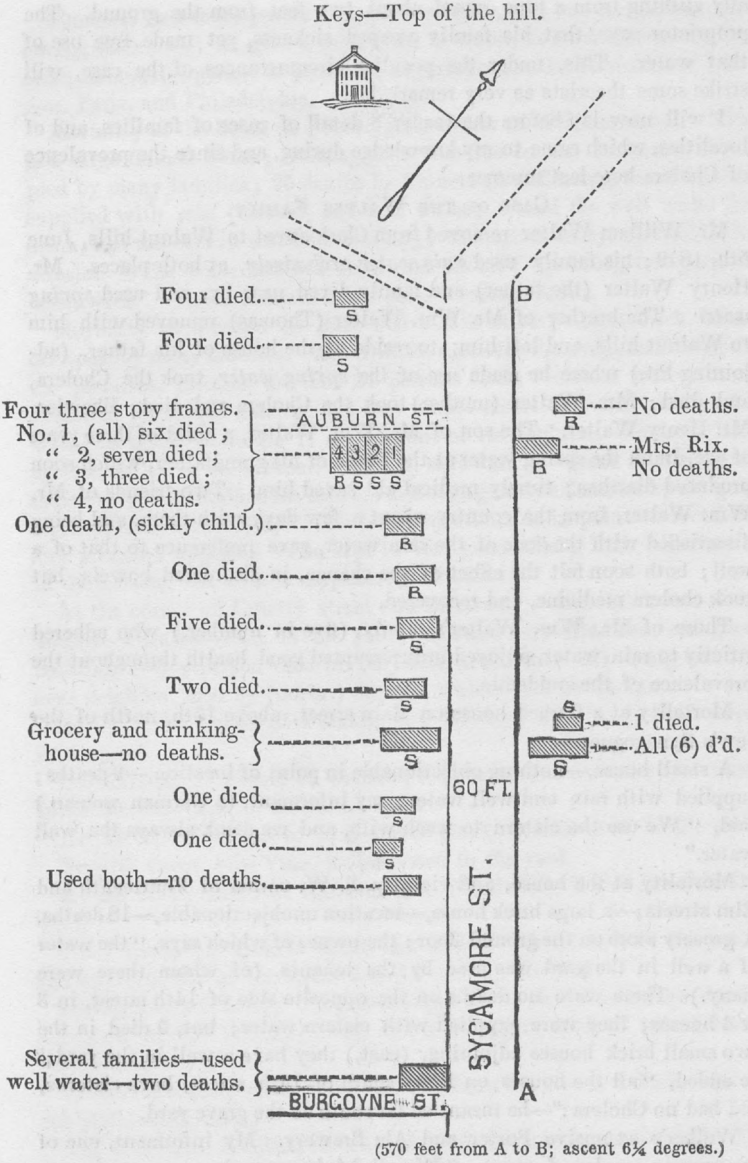
6,459

About 35,000 of the population are supplied with the river (Ohio) water,* in iron pipes, by steam power; this portion of the citizens was exempt in a remarkable degree from the epidemic. After diligent inquiry, I can hear of *but twelve deaths* on Fourth street, so far as it is supplied with river water, (about a mile and a quarter,) several of which may be attributed to gross imprudence. Beyond the supply of river water, the pestilence raged with frightful mortality, attacking those who drank well and spring water, but *passing by* all those who used *rain water*.

The annexed diagram of a portion of Sycamore street, on the side of the hill, presents a striking view of the relative effects of rain and spring water. This portion of that street has been but lately graded, paved, and built upon; the ascent is steep, and the houses are sparsely scattered, principally on one side, the hill in most places coming abruptly on the other. It is on the skirts of the city, and would be selected as *particularly exempt* from *malarial* influences, as in truth it is; yet with all its advantages, the water excepted, it has been almost depopulated. The abundant supply of *clear spring water* gave a peculiar value to this location. None of those houses were crowded; they are generally two and three stories in height; those numbered 1 to 4, had one family only in each, and three stories in height; the ventilation is all that can be desired, in all of them. It will be observed that one death is marked at a house where the family was reported to have used rain water; but it is altogether probable that the deceased had drunk *more than once* at the cool gushing fountain as he passed by in a hot day.

The *spring* is near the door of the "drinking house," and is continu-

* About 5,400 hydrants.



(570 feet from A to B; ascent 6¼ degrees.)

EXPLANATIONS.

A house.
R Denotes the use of Rain Water.
S " " Spring Water.

In the 19 houses on this sketch, 44 persons died; which, if we allow 6 to each house, gives a total of 114, being about 40 per cent.; had the whole city been supplied with the water of that spring, we might have suffered a mortality of near 40,000!

ally gushing from a pipe raised about two feet from the ground. The proprietor says, that his family escaped sickness, yet made free use of that water. This, under the peculiar circumstances of the case, will strike some theorists as very remarkable.

I will now lay before the reader a detail of cases of families, and of localities, which came to my knowledge during, and since the prevalence of Cholera here last summer:—

CASE OF THE WALTER FAMILY.

Mr. William Walter removed from Clark street to Walnut hills, June 5th, 1849; his family used *rain water exclusively*, at both places. Mr. Henry Walter (the father) and family lived near by, and used *spring water*. The brother of Mr. Wm. Walter (Thomas) removed with him to Walnut hills, and left him, to reside at the house of his father, (adjoining lot,) where he made use of the *spring water*, took the Cholera, and died; Mrs. Walter (mother) took the Cholera and died; likewise, Mr. Henry Walter. The son of Mr. Wm. Walter, a child of three years of age, drank the spring water at the house of his grandfather, which soon produced diarrhea; timely medical aid saved him. Two friends of Mr, Wm. Walter, from the country, spent a few days with them, and being dissatisfied with the *taste* of the rain water, gave preference to that of a well; both soon felt the effect of the change, in disordered bowels, but took cholera medicine, and recovered.

Those of Mr. Wm. Walter's family, (five in number,) who adhered strictly to rain water, enjoyed uninterrupted good health throughout the prevalence of the emidemic.

Mortality at a framed house on Race street, above 15th, north of the Jew's Synagogue:—

A small house,—nothing objectionable in point of location,—9 deaths; supplied with rain and well water; my informant, (a German woman,) said, "We use the cistern to wash with, and we drink always the well water."

Mortality at the house, and vicinity, S. W. corner of Fourteenth and Elm streets;—a large brick house,—location unobjectionable,—18 deaths. A grocery store on the ground floor; the owner of which says, "the water of a well in the yard was used by the tenants, (of whom there were many.) There were no deaths on the opposite side of 14th street, in 3 or 4 houses; they were supplied with cistern water; but, 5 died in the two small brick houses adjoining, (east,) they have a well in the yard;" he added, "all the houses on Elm, south of 14th street, have cisterns, and had no Cholera:"—he meant as far south as the grave yard.

Walker's extensive Porter and Ale Brewery. My informant, one of the persons employed, says:—"We all drink as much as we want; *one* won't drink anything but water;" (he drank well water, on Buckeye street;) "he was a sickly man and died—the rest of us all keep well—no Cholera."

There are four more porter and ale breweries, and but one person died among them; and he gave a preference to water, as I am informed; the same immunity appears to have been experienced at the breweries of London, Paris, and Philadelphia.

Mortality at the house on Plum street, corner of William street. This is a large framed house; nothing objectionable in the location; occupied by many families; 25 deaths by Cholera (5 children;) tenants,—all supplied with rain (cistern) and well water; "used the well water for drink, and the cistern water for washing; the rain is *nasty*, (probably an allusion to the color imbibed from coal soot off the roof,) but good to wash with." This information is from a woman, tenant.

Mortality at a house on Race above 15th street;—large brick house occupied by many families. Mr. Griffith, agent for the ower, and living on the premises, informs me that 24 persons died; "cistern water (rain) sufficient for all the tenants, but they would resort to a well near by for water to drink, prefering it on account of its coolness,—advised them against the use of well water." Mr. G. says that *he* "drank cistern water *exclusively*, and retained his health; although greatly exhausted by fatigue, anxiety, and loss of sleep." Nothing objectionable in point of location, and premises appeared to be kept in very good order; lime was strewn in the gutters, but with no apparent good effect.

At the corner of Liberty street and Broadway;—two brick two story houses—8 deaths—well in the yard; high and airy situation, and good buildings:—one person died in the house next door. Mr. Craig and his next neighbor, near by (north,) use rain water—had no Cholera.

At the S. W. corner of Franklin and Hanover streets, 10 died—*well* in the yard.

On Main street, corner of Orchard, 9 persons died in three two story frame houses,—*well* in the yard.

At the N. E. corner of 12th and Walnut, 7 died—*well* in the yard.

Twelfth street, near Vine, 2 died—*well* in the yard.

At the N. E. corner of Hanover and Woodward, 8 died; *well* in the yard.

Brick house on Tanner street, east side, 17 died,—*well* in the yard; and opposite side of the street 2 died,—*well* in the yard.

Spring street is nearly altogether supplied by cisterns, and no deaths occurred, except Mr. Raymond, and a little girl, both of whom drank well water.

House on Liberty street, first east of Mansfield street, 2 died; *well* in the yard,—(hill side.)

The Whittaker families, Deer Creek road, lost seven persons: Mr. W. says, "we used spring water altogether."

Dr. Ray, residing on Broadway, north of Franklin street, was very

careful in restricting his family to the use of rain water, but having a well on his premises, Mrs. R. drank of it by mistake; and although the quantity was but a *half pint*, decided symptoms of Cholera soon supervened, and her life was saved with great difficulty. Strange, and nearly fatal effect, of a *single glass* of well water!

In answer to a request for information from J. Frazer, Esq. at "Woodland, 21st December, 1849," one mile from the city, he says:—"During the recent prevalence of Cholera as an epidemic, my family, and my gardner's family, used cistern water exclusively, and both families escaped the disease. Five persons in my immediate vicinity had severe attacks of it, and three of the cases proved fatal; they all used hard limestone well or spring water."

The family of Mr. Bowler, about four miles north, consisting of 27 persons, used cistern (rain) water *exclusively*, and had not a case of Cholera among them. Mr. Gano's family—a little beyond Mr. Bowler's—of 17 persons, had no Cholera among them; they also used rain water *exclusively*;—it will be observed that these are large families.

* Sandusky suffered dreadfully by the epidemic; it fell upon that place with a degree of fatality seldom equalled; the greater part of the population fled from the town in dismay; it was impossible to procure decent burial for the dead, and fifty corpses were buried in one great hole!

Here we find a very pleasantly situated town, on a gentle slope from the Bay, (Lake Erie.) A want of cleanliness would be looked for here in vain; the population inferior to none in morals and industry; this mortality is readily accounted for. Sandusky is built upon limestone, which is but lightly covered with soil, and crops out in many places; the *wells* are sunk into the limestone;—thus the mystery is explained.

As the Cholera was reported to prevail with frightful malignancy at New Hope, about 40 miles east, I wrote to Mr. James J. Smith, of that place, for information; he says, in answer:—"At the time the Cholera visited this village, (6th July,) it contained 136 inhabitants, and out of that number 28 died in the short space of 22 days. It commenced about the same time in the neighborhood, not more than a mile from the village, and 23 of the inhabitants died; and two others, one of whom, the mother of some of the afflicted,—the other, a physician, making altogether 53;

* Honor! all honor and gratitude! to those men and women, who, after devoting themselves to hospital duty here, in constant attendance on the sick, hastened to a new field of hazardous, and fatiguing attendance on the sorely afflicted population of Sandusky. The cry of distress was heard as a summons, which was responded to promptly, and the following true philanthropists, were soon to be found at the bedsides of the sick and dying, viz: Drs. Strader, and Caroland, Mr. Baily, and two experienced nurses; they were soon followed by Doctors Ochiltree, Banks, Stevens, Foote, Hughes, Raymond, Lindsey, Quinn, and Follin: and Messrs. Yorke and Hinsdale:—Mrs. Couden, and five hospital nurses.

and the farthest being but little over three miles from this place. Upon inquiry, I find that the water used was limestone, in every family." Thus, in this small village, and a few farms near it, 52 persons died in a few days! Now, let us contrast this village with Vevay, on the *blue silurian* formation, on the bank of the Ohio, about 75 miles down the river, a town of about 2000 inhabitants; it was supplied by a large *public* well of calcareous water, the use of which was prohibited during the Cholera season, and the people used rain water, each house being provided with a cistern; the happy result from this prudential measure was, that not one of the *inhabitants* died with the Cholera!

Several towns of considerable population, as Lawrenceburg, Harrison, &c., situated on the alluvion, and where the wells produce *soft water*, have escaped the disease.

Lewis county, Kentucky, and some ten or twelve counties, from Fairfield county to the Ohio, in this State, are generally on sandstone formation, interspersed with iron ores, with a very small proportion of limestone; the water, therefore, is almost universally *soft*, (*sandstone*,) and the cholera has not prevailed epidemically in those counties; but when persons who resided there visited this city, during the prevalence of Cholera, they *seldom returned home again.* I knew of three men who came down in a boat from Lewis county last summer, all of whom took the Cholera and died; and two from Lancaster, Ohio, both died; and I believe very few escaped, if they used water alone, unless it were rain water.

As the disease prevailed with peculiar malignity, at *Birmingham*, near Pittsburgh, I wrote to a gentleman there for information; he says:—"In Pittsburgh, where the people use Alleghaney water exclusively, the deaths were but 25 to 30. In that part of Birmingham near the river, and where the river or rain water was used, there appeared to be no mortality; but the limited population near the hill, which used spring water, suffered much, the number of deaths being about 285. No beneficial effects were perceptible from the use of numerous coal fires, and large quantities of lime, the former being decidedly injurious."

The *strong array of facts* adduced might be greatly enlarged were it necessary; they prove conclusively that water containing *certain mineral elements* is a *proximate cause* of Cholera, and that rain water is a *prophylactic;* much *more certainly so, than that vaccination* is a *preventive of small pox!* for numerous cases have occurred *here lately*, of persons taking the small pox who had been vaccinated by the most respectable physicians; but I have not yet had reason to believe that a single individual has deceased who used rain water *exclusively;* and I believe the same remark will apply to the use of water that had been *boiled;* such was used by many families.

It cannot have escaped the observation of any one, that the disease

raged with the most intense malignity on the *higher and more airy* portions of this city; even those overlooking the whole of it; in some families *every individual* being carried off! whilst but few deaths occurred in the south-western part of the city, which lies low, and where the well water is not calcareous;—even where a stagnant pool laid at the door of a family, poor and needy, crowded into a small room, they all enjoyed good health; those who died in that part of the town were generally employed elsewhere through the day. The cause of the great number of deaths in those high and dry situations is evidently attributable to spring and well water.

The streets of the city were kept in good order; the weather* remarkably fine; electric phenomena about as usual, with frequent showers, and several dashing rains, well calculated to cleanse the streets. The ill-advised and preposterous fumigation by burning heaps of coals at the intersections of the streets, had a decidedly bad effect, especially on the sick; had a tithe of the money it cost to *produce this nuisance*, been expended by the city council in filling up the wells, hundreds of lives might have been saved.

It is not pretended that every one dies who drinks of the water usually so fatal; in a family of seven, six may die and one escape.

The most virulent contagion, as the plague, small pox, ship-fever, &c does not attack *every one* exposed to it; and it is well ascertained that some constitutions resist the effect of the virus of small pox, even when introduced into the blood by inoculation.

Although the use of spring water (when drank *alone*), has been generally attended with the most fatal results in this city and vicinity, such has not been so generally the case with the *well water* in certain parts of the city, for instance, the western, where the water is found by digging a few feet deep, and not far enough to reach the strata of limestone.

On referring to the *Report of Interments* by the Board of Health, (herewith) the enormous disproportion of deaths amongst the foreigners is strikingly manifested. I have no way to arrive at their numbers; it may be over 30,000, about one third of the population, yet the deaths amongst them appear to be about *three-fourths* of the whole number!

Now, it must be observed that great numbers in this category lacked timely medical aid, and many never had such aid at all, in fact there were not physicians enough in the city to attend *all* the sick, when about 200, (of all diseases) were dying per day; this class of inhabitants generally reside outside of the range of supply of river water, and depend upon the *wells*, even those who had rain water would go to their neighbours' well to get *good cold water*, and even when told *it would cause the*

* See tabular statements for the months of June and July.

cholera, as they were in numerous instances; they heeded not, and death was the consequence.

Crude vegetables were used without stint, by many persons,—such as cucumbers, radishes, celery, green apples, cabbage; all better adapted, *at such a time*, to the functions of a *gizzard*, than the human stomach; and highly acidulated edibles, as rhubarb, goosberries, &c., although *cooked*, were found to be injurious;—perhaps there is nothing more pernicious than an orange. The free use of the aforementioned, seldom failed to have a fatal effect on those who used the well or spring water; but cases were not rare of persons making free use of all those articles with impunity, who drank no other than rain water, and in *all those regions* exempt from Cholera, according to the Geological Theory, *all manner of fruits and vegetables may be used with as much impunity as before the Asiatic Cholera ever visited this country.*

I have just read, (this 14th March, 1850,) in a newspaper, an account of a party of forty-eight persons emigrating from Georgia to Texas; on reaching the Mississippi, they purchased a boat, and proceeded down that river; in a few days the Cholera attacked them, thirteen had died, and others taken the disease. These unfortunate people had lived in, and passed through, a region which enjoys immunity from Cholera, therefore the water of the Mississippi had the most fatal effect upon them.

When Cholera prevails intensely in a city, few persons will entirely escape its influence, however slightly affected. The heat, when the thermometer indicated over 90 deg., did not seem so oppressive as in healthy seasons; it was remarked in those hot days, "what a pleasant summer we have!" in other summers it would have been, "how very warm it is!" Can it be possible that the blood loses a portion of its caloric, by the influence of an atmosphere charged with the miasm of Cholera?

Paris, although but *half the size* of *London*, has lost *double* the *number* of its population; this may be explained by the Geological Theory. The former city, I think, is supplied from two sources,—one of which being the river Seine,—besides artesian wells; it can hardly be possible that there should not be a difference in the mineral elements of those waters, and an investigation will prove which has been the most deleterious. London is watered, I believe, from four sources, (exclusive of artesian wells,) and the above observations ought to apply to it. The Paris *basin* affords a fine *field* for the operations of Cholera!

Bremen does not suffer from Epidemic Cholera. In answer to a letter I wrote, (dated 13th March, 1848,) under date of 12th May, 1848, I have the following:—"Your letter was laid before the assembly of physicians of this city. It was returned to me, with thanks for the communication, and with the answer, that, leaving it undecided whether the observed facts arise from the chemical composition, or from the physical qualities

of the formation of the soil—there is no calcareous formation in the neighborhood of Bremen, and that the water with which vessels are supplied at this port, has been found entirely free from calcareous elements.

"When the Cholera ravaged Europe, that disease came also to Bremen, in autumn, 1834, but only a few persons were attacked by the disease, by which some died,—but the greatest part recovered in this place."

It will be understood that Bremen is a very considerable sea port, and that great numbers of emigrants go there from the interior, to take shipping for this country, many of whom are probably from infected districts. I believe that city escaped again last year.

A report was read before the Royal Academy of Medicine at Paris, 26th and 30th July, 1831, wherein it is stated:—"In the *northern Circars* encamped a division of 1000 artillerists, under the command of Col. Pearce. In the spring of 1781 this detachment proceeded to rejoin the main army on the coast. The Epidemic Cholera attacked this detachment. The disease was rapidly fatal; the catastrophe happened at the expiration of a few minutes, and in the midst of intolerable spasms. It was death, says Col. Pearce, and not disease, that reigned in the camp; out of 1000 soldiers, about 700 died. The epidemic ceased at the end of six days, in consequence of *changing the station.*" Now, changing the *station* could have had but little effect, had it not brought a *change* of *water* with it.

We had something very similar to the foregoing in our own country last summer. Major Morrison, with 400 Infantry, encamped near Port Lavaca, Texas. They were attacked by the Asiatic Cholera, and nearly one half of them died in a few days!—And here the much lamented Gen. Worth surrendered his life to the fell destroyer. It will be easy, now the thing is understood, to avoid such calamities for the future, by choosing proper locations, when danger from Cholera threatens. I have no knowledge of the geology of the region, but rely on the *facts* to sustain my theory.

It appears probable that the waters of *all large rivers* contain, in a greater or less degree, *proximate causes* of Cholera; they are found in our own. An analysis of the *mud* of the *Nile*, (by which we may form some judgment of *the water*,) shows it to consist of—

One half argillaceous earth,
One fourth carbonate of lime,
One tenth carbon, besides carbonate of magnesia, silica, and oxide of iron.

"*Egypt* lost 150,000 of its inhabitants by Cholera in 1831;" this, in a population of 2,000,000, is equal to 7½ per cent! The whole country, (five hundred miles in extent, but of *very limited* breadth,) depends upon the Nile; rain is seldom seen there. Now, let us suppose that the United States, with their 20,000,000 of inhabitants, had lost 7½ per cent. of their

population—the result is 1,500,000! Apply the rule to *China*, with its 350,000,000, and we have a destruction of 26,250,000!! It is supposed that the Cholera had very little effect on the Chinese; this may be attributable to the universal use of tea, as a common beverage in that country, and to no deficiency in the calcareous formations. This remarkable people may have discovered the pernicious effect on the bowels of calcareous water. We may judge of the quality of the water of the *Ganges* by its *effect;* in 1783, a crowd of pilgrims, (estimated at 1,000,000,) assembled on the banks of that river,—the Cholera attacked them, and in eight days it is said to have cut off 20,000; but did not affect the city of Jaualpore, only seven miles distant." It was well for *Jaualpore* that it was seven miles from the Ganges!

The cities on the great river *Volga* suffered much from Cholera. I have not facilities for further investigations on this point at present.

The great importance of having an analysis of the different waters where cholera prevailed, *more* or *less*, in degree, must strike every one. At my request, Doctor Strader procured (when on his errand of benevolence) at Sandusky, four bottles of water from wells in different parts of that town, judiciously selected; I took them to a chemist for analysis, but being asked twenty-five dollars for each specimen, I was obliged to forego the satisfaction of accomplishing this desirable object, by reason of the expense. It was my intention to have had ten or twelve specimens from different locations analyzed; to find, if possible in either, any *peculiar exciting cause*—how affected by *proportions* or *combinations*. It is said that cholera takes no effect where *chalybeate*, or *sulphur* water is used. Bi-carbonate of iron, when combined with the calcario-magnesian water, *may* neutralize its effect; *other* earthy elements, thus combined, *may* prove *exciting causes*, and account for the injurious effects of the water of the Mississippi, although it is what is termed *soft*.

Cities situated on *cliff-limestone* of certain properties, suffer less than those on the *silurian;* thus, Louisville suffers less than Nashville.

In the selection of water, the instinct of the *horse* leads him to choose that which is *soft*, and refuse the *hard*, or calcareous;—let *man* avail himself of the lesson!

The *magnitude* of the *shells* found in our rivers, indicates the calcareous quality of the water, and it will be found that they are *large* in *proportion to the quantity of the carbonate of lime held in solution.* Perhaps there are no *fresh-water* shells in the world so large as those of the *Little Miami river*. It is in the family of Naiades we find those so remarkable for size in that river. I have seen one of the genus *margarita* measuring 8½ by 6½ inches, and a *Unio* weighing 42 ounces. The shells of the "Miami" [Big] are not so large; and of the Ohio, *not half as large.* This fully sustains the Geological Theory, for it will be found that the

water of the former is *most* productive of cholera, and that of the latter the *least* so; although the former river discharges into the Ohio six miles above the city, and mixes with it—thereby being pumped up into the reservoir for city purposes; but its deleterious qualities are greatly diffused in the larger mass of the Ohio. * Many of the streams of the Eastern States of the Union, are so free from calcareous matter, that a shell-*fish* can scarcely find materials to construct a domicil thicker than common paper. I believe that the water of the Lower Mississippi is too turbid to produce shells.

The cholera prevailed in SICILY in the summer of the year 1837. The city of *Palermo* suffered terribly; perhaps more severely than any other city of Europe; out of a population of 170,000, it lost 37,000—upwards of 20 per cent! It is of the *becci*, or car-men of that city, I wish to speak:—† "They made the circuit of the deserted streets by the light of numerous fires of pitch, kept burning at long intervals, with a view of purifying the air. They sat upon the heap of livid corses piled up in their carts, stopping at each house where a light glimmering in the balcony indicated that their services were required. Entering without ceremony, they hastily stripped the body, and placing it on a cart, resumed their progress—generally singing, as they went, under the influence of intoxication or unnatural excitement! Arrived at the campo santo, their burdens were quickly deposited in large pits, and the same course repeated until sunrise. It is remarkable, that of one hundred and fifty-six of those regularly employed in this way, but *three* fell victims to the cholera." Hence it would appear that the pernicious quality of the water used by those *becci*, was neutralized by Alcohol; this is very well understood here; but we find the use of rain water, from the multiplicity of facts now collected, answers a much *better purpose*, for it has all the *good* results, without the *evil*. I have no knowledge of the mineral properties of the water at Palermo, except from their effects, and rely confidently upon them to sustain my theory.

However great the per centum of mortality was at Palermo, it is only about one half of that of Sycamore street, hill side!

The sub-acid *orange*, of which Sicily produces such quantities, (with which our city is now so super-abundantly supplied,) is probably a more exciting cause than any other *fruit*,—or perhaps I might add vegetable. This was observed by the physicians of New Orleans in 1832, and the use of them is forbidden entirely:—not so in Mobile, where they are eaten without bad effect, owing to the quality of the water used there. It has

* It would be better for the health of the city, if the water could be taken from above the mouth of the Little Miami.

† Tuckerman's Italian Sketch Book.

occurred to me that the very free use of this fruit at Palermo, may have contributed largely to the fatal effect of cholera in that city;—and yet no such cause was in operation to produce the *still greater* proportionate mortality on Sycamore street, and other localities in this city.

The intelligent reader will readily perceive the difficulty of obtaining precisely the truth, in some cases, in regard to what may have been the diet or *drink* in *certain* families. I think that there is scarcely an individual in a score in this city, who would not take a drink of *cold well water*, in a hot summer's day,—even when assured that it might cost him his life—in preference to *rain water*; which, unless cooled by ice, is far less palatable.

I expected to find many deaths in families where they *said* rain water had always been used, for the reasons just mentioned; yet I have found but the one marked on the diagram. There is, therefore, the strongest reason to come to the conclusion, *that if any person dies from cholera, who used rain water exclusively,* it must be merely an *exception* to a *general rule:*—other water equally pure must have the same effect—thus we have *one great truth*—not an *unverified hypothesis*—in regard to averting the malignity of this much dreaded disease, *deduced from hundreds of cases*;—disarming the slayer of millions of his terrors!

It is devoutly to be hoped, that those whose vocation leads them to such pursuits, will search into the *peculiar properties* of water, and *relative quantities*, or *proportions*, of certain mineral elements held in solution; (calcario-magnesian, it is presumed, being always found present,) and they must discover *where the enemy lurks!*—where his *strong hold is!*—*what urges him on*, in his swiftest career of destruction?

It would be very gratifying to me, to expend some hundreds of dollars in procuring analyses of waters in differeent locations here and elsewhere, but it is not convenient:—I am constrained to guard against a *collapse of the purse!* I trust the *Government* will view this matter in its true light, and make an appropriation to be placed in *proper hands*, for a thorough investigation of this important subject:—interesting as it is to the present and all *future* generations. Although on the verge of three score and ten, I yet hope to see the result of a thorough investigation;—no time should be lost!—a favorable *Report*, from High Authority, would cause a general diffusion of *reliable information*, of incalculable importance to mankind. Investigation will prove, that of all the malignant scourges to which afflicted humanity is subjected, that of the *Cholera* is the most readily guarded against!

It is much to be lamented that medical men, with few exceptions, have thought the *Geologieal Theory* unworthy of serious investigation, although it was pressed upon *them*, and the public generally, nearly two years since, through the medium of the "Gazette," and other city papers; and last

summer, even when *beset* by the *facts* whence to deduce the most *logical* conclusions of its *correctness*, and accordance with, *that which is,—has been—and will be!*—still it was looked upon as visionary—absurd!

It will now force itself upon them—*bon gre, mal gre!*—and *must* receive the credence that it is entitled to, which cannot fail to be attended with the most beneficial results.

The *capriciousness of the cholera*, has been frequently a subject of remark and astonishment:—attacking *this* part of a city and not *that; this* village and not *that; this isolated family*, and not the *one* on *the farm adjoining!* The *Geological Theory* will explain all that, and show that there is no disease *less capricious!* No other disease, of its itinerant character, in regard to which you can say—pointing to a geological map,—*here* it *may come*, but *there* it *will not!*

It is very gratifying to be enabled to add the testimony to the truth of the *Geological Theory*, of one so well and so favorably known as Miss Dorothea L. Dix, the Philanthropist. Perhaps the annals of philanthropy do not furnish an instance of such persevering and successful devotion to the relief of afflicted humanity. Braving the frosts and storms of winter, and the heats of summer, she journies alone and unprotected;—hazards her health, and sets personal comfort and repose at naught, in the steady pursuit of the sublime object of her mission!

This very estimable lady has been most assiduously engaged for some years past, in procuring the establishment of *Asylums for the Insane;* these are established by enactment of the State Legislatures, and now amount to THIRTEEN; at an aggregate cost of probably a million and a half of dollars.

Miss Dix has been for some time engaged in the South, and has returned just in time to enable me to add facts and opinions—being the result of her experience in the districts where the cholera is actually prevailing; she says:—"Rain water is coming into use on some sugar plantations with complete success as a preventive of cholera; on such, the slaves enjoy good health, whilst that disease is destroying those on the adjoining estates, who use the *river* water;—that at Jackson, Mississippi, much rain water is used, and the *general health* of the place is much improved." She carefully avoided drinking any other than rain water, or that which had been boiled, (as in tea or coffee,) except on the passage to Nashville, up the Cumberland river, where she took about half a glass of the water of that stream, the injurious effects of which she was speedily made sensible of, and added,—"I fully sustain your Theory."

The experience and intelligence of my friend *Doctor Ray*, gives great

weight to the information contained in the following communication just received from him:—

"From a knowledge of several of the facts collected by you relative to the localities visited by the cholera in 1832–3, I came to the conclusion that the use of limestone or hard well water, would be dangerous should the cholera again visit this city. Accordingly, in the discharge of my duties as a member of the sanitory committee of the 9th Ward, I warned the people that *well* water ought not to be used, and recommended cistern, or hydrant water.

Mr. John S. Powers and myself had the supervision of Spring and Pendleton streets, between Woodward and Liberty streets. On Spring street, cistern water is used nearly exclusively. On this street, between the streees above named, there are thirty-six dwelling houses, occupied by about two hundred persons; out of this number, there were but two fatal cases of cholera, and both these had used *well* water. On Pendleton street, which runs parallel with Spring, and about two hundred feet east of it, well water is more freely used. On this street there were thirteen deaths by cholera,—*all* of which occurred among those who used *well* water—there being *no* death among those who used only cistern water. Pendleton street is higher and more airy than Spring street, and the population is about one half that of the latter; hence the per cent. of mortality was *thirteen times* as great.

With the evidence of these facts, and many others of a similar character, that I might give, I cannot avoid the conclusion that the use of well water during the prevalence of cholera, is often followed by fatal consequences.

It is proper to observe, however, that a few persons residing on Spring street, who did not use well water, were affected with cholera—but the disease was mild, and readily yielded to the ordinary treatment.

* * * * When cholera is prevailing, I would discourage the use of well or spring water,—and would at the same time urge a strict attention to cleanliness, ventilation, the avoidance of crude, raw, or unripe fruits and vegetables,—and the observance of all the great laws of health."

With great esteem,
Your friend,
JOSEPH RAY."

WOODWARD COLLEGE,
April 13th, 1850.

I am informed by a gentleman just returned from a visit to *Charleston*, South Carolina, that rain water is in general use in that city, except in seasons of unusual drouth, when the wells are resorted to;—this accounts for its escape from epidemic cholera, and likewise for the usual good

health of its inhabitants—although hemmed in by an extremely malarious district of country. A portion of those wells may produce *hard* water, and it is quite probable that if the infection of cholera reached that city when the use of well water was compulsory, that it would prove epidemical. So large a portion of Charleston borders on salt water, that it would be reasonable to expect that the water of the wells would be strongly impregnated with muriate of soda, which is sufficient to account for its being *hard.*

APPENDIX.

Croton water,—one gallon contains 6⅔ grs. solid matter,

about 1-6 grs. chloride of sodium.
3-8 " " lime,
1-6 " " alumine,
1-6 " sulphate soda,
1-4 " " lime,
5-6 " phosphate alumine,
1-14 " silicic acid,
2-⅛ " carbonate lime,
1-16 " " magnesia,
1-5.6 " salts, soda, and organic acids—a trace of manganese.

"The Croton water at New York, is now distributed to about 37,000 houses; 7,000 houses covering many miles of streets, are out of reach of supply from that source; the *Mains* are laid down for 200 miles."

—

Analysis of one gallon of water—*Schuylkill river.*

Chloride sodium,	.1470
" magnesium,	.0094
" aluminium,	.0570
Sulphate magnesium,	.0570
Silicic acid,	.0800
Carbonate lime,	1.8720
" magnesia,	.3510
Salts, soda with silicic and organic acids,	1.6436

—

Boston—*Cochituate*—or *Long Pond.*

Chloride potasium,	.0380
" sodium,	.0323
" calcicum,	.0308
" magnesium,	.0764
Sulphate magnesium,	.1020
Alumina,	.0800
Silicic acid,	.0300
Carbonate lime,	.2380
" magnesia,	.0630

CHRONOLOGY OF CHOLERA.

The following historical dates in Cholera, may be both interesting and useful.

The Cholera broke out in the following places, at the dates annexed:—

At Moscow (Russia) September 28th. 1830. Sunderland (England) October 28th, 1831. Quebec, (America) June 8th, 1832. New York, June 27th, 1832. Philadelphia, July 30th, 1832. Louisville, Sept. 18th, 1832. Cincinnati, Sept. 30th. 1832. Nashville, Dec. 18th, 1832.

In Cincinnati the cholera had ceased almost entirely on the 1st December, and there was none of it (unless perhaps two or three cases) during the winter of 1832–'3. In April, or May next, it again broke out, and prevailed in Cincinnati with considerable severity during the summer. In the winter it was again silenced; but in the summer of 1834 it again broke out; but in the latter part of the season was absent entirely; when on a certain day in October, it again burst out in a large number of cases in one night, after which it disappeared entirely.

Of its *progress* in the United States, the following facts are worth noticing. It landed at the Quarantine ground of Quebec, from an *emigrant ship*. It passed up the St. Lawrence to Montreal with the emigrants. It passed down the Champlain Canal in *canal boats*. It passed along the Erie Canal in *canal boats*. It passed along the Lakes in *steam boats*. It broke out among the soldiers of Scott's Army, in steam boats. It arrived at Chicago. It passed with them to the Upper Mississippi. It reached Lousville in the *steam boat* Columbus. It *ascended* the Ohio in steam boats. It arrived at Lousville before Cincinnati; at Cincinnati before Wheeling; and Wheeling before Pittsburgh! Pittsburgh is but 300 miles by land from Philadelphia, and yet the cholera arrived at Pittsburgh by a circuitous *water course* of 3000 miles! But in that water travelling, it pursued steadily *the line of passengers, emigrants and business*.

This fact is not to be got over by any theory. It signalizes the progress of cholera in the United States more than any one thing.

The above is cut from a newspaper, and is probably correct. The miasm of cholera appears to be carried in clothing, &c., and is thus transported across the Ocean.

Cholera in Russia.

According to recent official data on the cholera in Russia, during its last invasion 1,686,848 persons were attacked by it, and 668,012 of this number died.

The following may prove useful for reference:—

Cholera in 1832 and 1833.

The *Nonpareil* states that with considerable labor the following table

has been compiled for that paper from reliable authority. It shows the interments in the several burial grounds during the epidemic in 1832 and 1833:—

	Cholera.	*Other Dis.*
October 10 to October 31,	343	139
November 1 to November 15,	37	46
November 15 to November 30,	6	34
December,	3	not reported.
January, 1833,	2	do
February,	3	do
March,	none	do
April,	1	do
May,	27	do
June,	67	do
July,	172	do
August,	38	do
September, here disease left city,	none.	do
Add for September, 1832, estimate,	37	do
Total,	736	

It thus appears that during the first epidemic the whole number of deaths by cholera was 736. Of this number only 107 were of foreign origin. This fact is ascertained by an examination of the names.

ANNUAL MORTALITY OF CITIES.

London,	1 in 45
St. Petersburgh,	1 in 20
Genoa,	1 in 46
Paris,	1 in 32
Berlin,	1 in 34
Vienna,	1 in 25
Rome,	1 in 31
Geneva,	1 in 40
Philadelphia,	1 in 42
Boston,	1 in 40
New York,	1 in 35
New Orleans,	1 in 20
St. Louis,	1 in 25
Total,	13 435

REPORT OF THE BOARD OF HEALTH, CINCINNATI, Aug. 31, '49.

The three first on the list are Catholic Cemeteries.

Report of Interments in the following Cemeteries, from May 1st, to Aug. 30th, 1849.

	Cholera.	*Other Dis.*
St. Joseph's, Irish,	460	284
St. Joseph's, German,	730	369
St. Peter's, Lick Run,	913	335
Wesleyan Cemetery, Mill Creek,	270	235
Methodist Protestant,	115	86
German Protestant, Reading Pike,	206	79
German Protestant, Walnut Hills	258	126
Spring Grove Cemetery,	36	144
Episcopal, in the city,	42	18
Presbyterian, in the city,	50	26
Baptist, Catherine street,	77	78
Methodist, Catherine street,	59	38
Potter's Field,	408	258
Friends	8	4
Hebrew,	43	13
German Prot., St. Peters. W. Row,	286	140
American Association, Colored,	72	73
Walnut Hills Cemetery,	55	33
Warsaw,	25	5
	4114	2345
Total,		6459

METEOROLOGICAL TABLE.

CINCINNATI, June, 1849.

Thermometer.			Weather.				
Date.....	Minimum	Maximum	Sunrise...	Noon.....	Sunset....	Rain.....	Winds, &c.
1	59°	84°	clear	cl'r & rain	clear	.15	Light s. west'ly, squally, so. west'ly and calm.
2	64	84	"	clear	"		" southerly.
3	65	88	"	"	"		" south westerly.
4	67	90	"	"	"		" " " and variable.
5	63	85	"	"	"		" north easterly—calm at night.
6	65	79	"	"	var. & rain	.10	" easterly, and light south easterly.
7	69	86	"	"	rain & cl'r	.20	" southerly, and calm.
8	74	87	clou & rain	"	var. & rain	.80	Calm, light westerly, and calm.
9	68	78	clou. cl'r & rain		clear	.05	" " northerly and "
10	61	79	var & rain	clear	"	.10	Light south easterly, and calm.
11	64	80	clear &	"	"	.10	" "
12	68	84	cloudy	variable	"		" southerly, and south westerly.
13	70	89	var.	clear	var.		" " brisk southerly, P. M.
14	72	89	"	"	var & rain	.20	" " " south westerly.
15	70	83	clear	"	clear		" south westerly, and westerly.
16	62	79	"	"	"		" north " calm at evening.
17	61	85	"	"	"		Calm and light, southerly.
18	62	88	"	"	"		" " " and calm.
19	68	89	"	"	"		Light scutherly, and calm.
20	69	93	"	"	"		Calm, very light, southerly, and calm.
21	70	92	"	"	"		" light, " calm.
22	72	93	"	"	"		" and brisk southerly, calm at night.
23	75	87	"	"	clear & rain	.05	" light " heavy thunder.
24	73	84	cloudy	cl'r & rain	var.	.65	" " brisk south westerly, and calm.
25	72	83	fog & var.	clou rain &	cl'r	.15	" " southerly and calm.
26	74	90	cloudy	clear	clear		" " and "
27	74	87	clear	& rain	var & rain	.35	" " s. easterly, and west'ly, and calm.
28	73	86	"	" &	" &	.40	" " southerly, brisk westerly, and "
29	72	87	"	" &	cl'r &	1.25	" " south'ly thun. and light. and calm.
30	72	88	cloudy	var.	var.		" " no. westerly, P. M., and calm, — thun. at night.

Rain Inches....4.55

Clear days in the month.....12
Variable (cloudy at times).....18
Cloudy (total absence of sun)...00

30

Max. heat of sun on the 22d....121°
" " " 26th....122°
Mean temp. of the month.....76.96
Mean temp. of June, 1848.....72.14
" " 1847.....70.36
" " 1846:...69.84
" " 1845.....74.00
" " 1844.....73.20
" " 1843.....70.77

Barometer.

	Min.	Max.	Mean.
June—	29.011	29.505	29.2412

REMARKS—An unnsual number of showers in this month, and more calms, and light winds, than usual.

The mean temperature near 3° higher than usual.

The thermometer is in a *proper* location, and *correct*

JOHN LEA.

NOTE.—The mean quantity of rain, and melted snow, that has fallen in the last ten years, in this city, is 49.30 inches.

METEOROLOGICAL TABLE.

CINCINNATI, July 1849.

Date.....	Thermometer. Minimum...	Maximum..	Weather. Sunrise....	Noon.....	Sunset.....	Rain.....	Winds, &c.
I	69o	84o	rain	clear	clear	2.35	Light south easterly,
2	64	78	clear	clear	clear		" northerly, brisk easterly, calm at night.
3	64	81	clear	clear	clear		Brisk easterly, light do at evening
4	61	82	clear	clear	clear		" " " do calm at evening
5	61	82	clear	clear	clear		Light southerly, brisk, P. M., light at evening.
6	68	69	drizzle	rain	rain	1.10	" " " calm at night
7	67	77	cloudy	var. rain & clear		.30	" " and south westerly.. " "
8	71	83	cloudy	var.	var.		Calm and light south, s. easterly and calm, heavy thunder
9	76	91	r'n & cl'r	clear	clear	2.45	" " s. west and westerly, calm at night thunder
10	77	90	r'n & var.	clear	clear	.15	Calm and light southerly, calm at evening..
11	75	92	clear	clear	var. & rain	.10	Light so. easterly, " "
12	71	90	clear	clear	clear		" southerly
13	74	92	clear	clear	clear		" " calm evening and night
14	76	82	variable	clear	clear		Light and northerly
15	64	83	clear	clear	clear		Light n. westerly, calm at evening
16	63	85	clear	clear	clear		" s. easterly " "
17	64	84	clear	clear	rain & clear	.10	Calm and light southerly
18	67	88	fog & cl'r	clear	clear		" very " "
19	69	88	clear	clear	clear & rain	.15	" and light "
20	74	85	cl'y & r'n	var.	clear	.05	" and brisk. s. westerly, calm at night....
21	73	83	var.	clear	clear		" and light westerly, brisk n. westerly...
22	65	82	clear	clear	clear		Light easterly
23	64	86	clear	clear	clear		Light n. easterly, brisk easterly and calm..
24	67	82	var	cloudy	rain	1.15	Light south easterly
25	72	83	cl'y & rain	var.	rain	.40	Brisk southerly
26	71	88	clear	clear	rain & clear	.15	Light north westerly
27	70	84	var.	clear	clear		Calm A. M., light south easterly P. M.
28	70	87	clear	clear	clear		Light and southerly, calm at night
29	70	85	clear	cl'r & r'n	clear	.15	" " A. M., brisk s. w. P. M., calm at evening
30	76	82	cl'r & r'n	var.	clear	.40	" s. west'ly (heavy thunder) and west'ly.
31	60	77	clear	clear	clear		" n. easterly, calm at night
					Rain Inches....	9.00	

Clear days in the month.....13
Variable (cloudy at times).....17
Cloudy (total absence of sun).....1
31

Max. heat of the sun on the 3rd....121o
" " " 11th....128o
" " " 13th....125o
" " " 21st....114o
" " " 26th....124o

Mean temperature of the month..76.42
Do do July, 1848,....73.86
Do do July, 1847.....74.42
Do do July, 1846.....76.00
Do do July, 1845.....75.84
Do do July, 1844.....78.47
Do do July, 1843,....75.10

Barometer.

	Min.	Max.	Mean
July—	29.097	29.513	29.3090

REMARKS—Mean temp. of the month rather over the usual average.

Quantity of rain considerably over the usual average; yet there was but one day in which the sun was not visible. Calms have been frequent throughout the month, and no high wind occurred. The course of the wind has been carefully taken from the direction of the smoke, as the vanes are not to be depended upon in light winds.

The greatest number of deaths by Cholera alone (137) occurred on the 5th July.

JOHN LEA.