HISTORY

OF THE

EPIDEMIC OF YELLOW FEVER

IN

CHARLESTON, S. C., IN 1854.

BY

D. J. CAIN, M. D.

EXTRACTED FROM THE

VOLUME OF THE TRANSACTIONS OF THE ASSOCIATION.

PHILADELPHIA:
T. K. AND P. G. COLLINS, PRINTERS.
1856.

HISTORY.

THE summer of 1854 will long be remembered, in Charleston, for the intensity and protraction of its heat. The winter and spring had been generally mild; but the cool weather continued to the early part of June, when the warm weather exploded. The heat which ensued was greater than that of any year since 1804, the thermometer marking as the extreme 95° on the 9th of July. Hot as the weather was thermometrically, it was still hotter sensationally, even the breeze being hot, parching, unrefreshing by reason of its prevalence chiefly from the land side. The systems of all exposed to the influence of weather of such character were, consequently, relaxed, enervated in a great degree, and several cases of *coup-de-soleil* occurred.

The quantity of rain which fell in May, was 5.29 inches; in June, 4.18; in July, 6.62; in August, 1.56; and in September, 8.73 inches.

The register thermometer marked for

	Day mean.	Night mean.
May	79.80	64.50
June	84.63	70.90
July	88.74	73.96
August	89.12	75.16
September	85.23	71.83
October	76.61	58.67

The mean dew-point in May, was 68.67; June, 72.50; July, 76.70; August, 77.29; September, 73.83.

It will be seen by the above brief statement of the meteorological conditions which existed in the summer, that there was a proclivity to the forms of malarial fever; but so far from the fact of cases of these fevers having been either numerous or violent, only a few mild cases of both were reported at a meeting of the Medical

Society of this city, to have been observed in June and July. The origin of periodical fevers, I may remark by the way, is very uncommon in Charleston; it is only in the suburbs, on the very outskirts, that they occur. When they have been observed in the city, they have usually heralded the approach of, or accompanied yellow fever.

The streets and sewers had been kept as clean as usual, and no excavations or upturnings of the soil had been made since April; but a number of lots, particularly in the western part of the city, had been in process of reclamation during the last two or three years, the filling being made with sawdust and other fermentable materials, with no superstratum of sand, or other earthy matter, to prevent the truly offensive emanations arising from their decomposition. Such were the conditions meteorological and telluric, which existed at the time the yellow fever made its appearance.

I will now proceed to give the dates and order of succession of the cases of the disease, until they became too numerous and scattered to offer interest in any point of view whatsoever.

On the 11th of May the steamship Isabel arrived from Havana and Key West, at both which places yellow fever was prevailing. Three days after her arrival, a steerage passenger who had been taken in at Key West was admitted into the Marine Hospital under my care, with well-marked yellow fever. He threw up black vomit during four days consecutively, but recovered.

On the 11th of July, the Isabel again arrived from the same ports. One of her passengers, an Irish nurse, went to a hotel, complaining that she felt badly from the effects of sea-sickness. The following afternoon she attempted to leave in one of the New York steamships, but was prevented from doing so by her extreme illness. Her case having by that time assumed the features of yellow fever, she was sent to the Lazaretto that night, when and where she died, throwing up black vomit freely.

The British barque Aquatic sailed, on the 25th of June, from Matanzas, Cuba, for Cork, Ireland, with a cargo of molasses. On the 3d of July one, and on the 4th another, of the crew died of fever; on the 4th two more men were attacked; about this time the vessel sprang a leak, and the remainder of the crew being more or less disabled, the captain was forced to run her ashore near Georgetown, S. C.; here she was relieved of a portion of her cargo, and as much water pumped out of her as was necessary to prevent her from sinking. She was then towed to quarantine ground, Charleston harbor, with her hold in a very foul state; the crew, although

not sick, were sent to the Lazaretto, and she was allowed to come up to North Commercial Wharf on the 13th of July. She remained there two days and then went up to Dry Dock Wharf, where she was finally pumped out and disinfected.

The Spanish polacres, Concha and Columbus, arrived on the 21st of July, the former at Central Wharves, the latter at Accommodation Wharf, after an 8 days' passage from Havana. Two days after the Columbus left Havana, one of the crew died of yellow fever; but at the time of arrival in Charleston the crews of both vessels were well. Four days after their arrival, a seaman was attacked on the Columbus, and sent to the Lazaretto, where he died of yellow fever. She was then ordered to Quarantine, where she was disinfected. Several cases, called by the attending physician *catarrhal*, occurred on the 25th of July, on the Concha, one of which appearing to the port physician to be rather suspicious, was sent to the Lazaretto, where he recovered, as did the others.

That the cases so far reported were imported will hardly be denied.

The ship Sullivan, from New York, arrived the 21st of July (the same day on which the Concha and Columbus arrived) and went into the same dock with the Columbus, but at Central Wharves. On the 4th of August one of her crew was attacked and was admitted into the Marine Hospital on the 7th, with well-marked yellow fever; on the 9th he was transferred, together with another from the same ship who was seized on the 7th, to the Lazaretto. The former died on the 10th with black vomit; the latter recovered.

The barque Vesta, from Boston, arrived July the 16th at Dry Dock wharf, and lay next south of the Aquatic, in the same dock. On the 7th of August one of the crew was attacked with yellow fever, and was sent into the Marine Hospital, whence he was taken on the 9th, with the two from the Sullivan to the Lazaretto. On the 9th another was attacked, was admitted into the hospital on the 11th, and died with black vomit on the 15th.

On the 7th of August, Mr. S., a native of Barcelona, Spain, clerk to Hall & Co., consignees of the Spanish polacres, Concha and Columbus, was attacked at his residence, the Planters' Hotel, Queen Street, with yellow fever and recovered. Mr. S. had been several times on board the Concha, had taken several meals there, and even indulged in a *siesta*.

The brig Iris, from Rockland, Maine, arrived on the 22d of July at Custom House Wharf. August the 1st she hauled round to

Potter's Mill in the Ashley River, about one mile westward of the city. On the 10th of August, the captain, after having been several days sick, was admitted into the Marine Hospital, with yellow fever; he was extremely ill, but finally recovered.

Mr. Garvey, residing at No. 20 Pinckney Street, a stevedore, was employed in pumping out and disinfecting the barque Aquatic, during the greater part of which time he worked in the hold. While heated by work he was wet by rain and was attacked on the 11th. A physician was called to see him on the 13th, and he died on the 15th, of coma. About the same time, Mr. McNeall, an Irishman employed with Mr. Garvey in the hold of the Aquatic, likewise sickened with yellow fever, but recovered. Of fifteen men employed on the *deck* of that vessel *two* died. (Dr. W. Hume, *Charleston Medical Journal and Review*, vol. x. No. 1.)

The barque Aura, from New Orleans, arrived August the 3d, at Brown's Wharf. On the 10th the captain was seized by yellow fever: on the 12th she went to Potter's Mill, Ashley River. On the 13th one of the seamen was attacked; he was admitted into the Marine Hospital on the 14th, and recovered.

An Irishwoman in the service of Mr. G. M., East Bay Street, opposite to North Commercial Wharf (where the barque Aquatic lay during two days), was attacked on the 12th of August, and died on the 16th with black vomit.

Mrs. Gorham, an Irishwoman, residing at No. —, Calhoun Street, was attacked on the 15th, and died with black vomit on the 18th. Her daughter, two years of age, was attacked on the 17th, and died with black vomit on the 20th.

Mr. F., from Columbia, S. C., a clerk to Mr. D., whose office is on North Central Wharf, near the berth of the Concha, which vessel he visited, as did Mr. S., above mentioned, was attacked on the 17th August, and died at his place of residence, the Victoria Hotel, King Street, on the 27th, with black vomit.

The schooner Monterey, from Philadelphia, arrived at Central Wharves on the 7th August. On the 15th, one of the crew was seized with the fever, and entered the Marine Hospital on the 17th. He recovered.

The schooner Susan Cannon, from Baltimore, arrived at Central Wharves on the 7th August. On the 17th, one seaman was admitted into the Marine Hospital, and died with black vomit by stool, on the 22d.

The schooner J. P. Brown, from Philadelphia, arrived at Central

Wharves, on the 8th August. On the 15th, she went to Potter's Mill, Ashley River, to load with lumber. On the 17th, one of the crew was admitted into the Marine Hospital, and died on the 19th with black vomit.

The schooner Maryland, from Baltimore, arrived at Central Wharves, on the 9th August. On the 17th, the captain entered the Marine Hospital, and died of coma on the 21st.

The brig Emily, from New York, arrived at Accommodation Wharf, August 8th. On the 15th, a seaman was attacked, entered the Marine Hospital on the 18th, and died on the 20th, with black vomit.

The schooner Henry Nutt, from Philadelphia, arrived at Central Wharves, August 9th, and lay there until the 16th, when she hauled to Boyce & Co.'s wharf, which is the eighth wharf below Central. On the 17th, the captain sickened with yellow fever and recovered. On 21st, one of the crew was attacked, was sent to the Marine Hospital on the 22d, and recovered.

A painter, residing at 33 Broad Street, was attacked on the 18th August, and died a few days after.

On the 19th, two Germans, residing at the foot of Hasell Street, were seized and died, the one on the 22d, the other on the 23d.

The schooner Yorktown, from Baltimore, arrived at Central Wharves on the 10th August, where she lay until the 19th, when she went into the Ashley River to take in a load of lumber. On the 21st, the captain was seized with yellow fever, and recovered.

The schooner Maine Law, from Philadelphia, arrived at Central Wharves, 9th August. She lay there four days, and went into the Ashley River. On the 21st, two seamen, natives of Azores, were attacked, and admitted into the Marine Hospital. Both died on the 25th, with black vomit. On the 22d, two other seamen were attacked, and died on the 27th, with black vomit. Two more—making six in all, the whole crew—died subsequently.

The Spanish barque Mallorquin, from Porto Rico, arrived at Central Wharves on the —— August. The captain was attacked on the 22d, and died on the 24th, with black vomit. Two of her crew, attacked about the same time, were sent to the Marine Hospital, and recovered.

It is unnecessary to extend further the account of the earlier cases of the disease, since its spread among the unacclimated foreign population, chiefly the Irish and Germans, was very rapid.

Instead of first attacking, and being limited for a time to, its old range, viz: that portion of the city bounded by Tradd Street on the south, Wentworth on the north, King on the west, and the harbor on the east, it seized and bore severely on those parts, such as Calhoun and Franklin Streets, which were low and damp (the latter recently reclaimed), and crowded with the laboring foreign population just mentioned. In the course of a month, it overleaped even the extreme limits of its former prevalence, and invaded all parts of the city, its geographical distribution being more extensive than ever before known. From Line Street to South Bay, from the Cooper to the Ashley River, low spots and high sand-ridges, where water nearly free from brackish taste is found, all suffered alike; no portion, whatever its terrene condition, escaping its visitation. Nor sex, nor race, nor condition, nor age, enjoyed an exemption from it; in short, so universal was its diffusion, so great the number attacked, as nearly to entitle it to the appellation of "Pandemic."

During the month of August, and the first half of that of September, the disease confined its attacks almost exclusively to the foreign population, both Europeans and the people of the United States, the native population resisting it. But, after this time, they yielded to its influence, first children, both white and black, then adolescents, and finally adults up to middle age.

On the 8th of September, a violent storm occurred, which lasted three days, by which, there being a coincidence of northeasterly wind, full moon, and abundant rain, all the low parts of the city were submerged. Its effect in causing an aggravation of the cases then under treatment, and an increase of new cases, by reason of the wetting to which many were subjected, was immediately manifest; the number of deaths reported for the week following the storm amounting to 129, the greatest number that took place in any one week. So that the epidemic may be said to have reached its culminating point at this time, its decline subsequently being quite apparent. Now, it is extremely probable, that although the *immediate* effect of the storm was that which has been stated, yet, that by washing the impurities from the surface, cleansing the sewers, ventilating the narrow lots, courts, lanes, cellars, &c. &c., and changing the meteorological state, it was ultimately beneficial, may be inferred from inspection of the table of the weekly mortality, introduced elsewhere. During the month of October, the decrease of cases and of weekly deaths was rapid; and the cessa-

tion of the disease in what is called the "epidemic" form, may be dated from the end of this month.

The *general features* of the fever did not differ from those it has presented in former epidemics; the hemorrhagic character which has marked the disease of late as prevailing here, being conspicuous in this instance.

Passing over the symptoms as not deviating in a notable manner from those of other epidemics, I come, in the next place, to the mortality.

By reason of the general prevalence of cholera in the Northern and Eastern States, there was a smaller amount than usual of travel among our population: persons who had been in the habit of absenting themselves every summer, remained at home; so that a larger number, relatively and absolutely, were exposed to the influence of the disease than in former epidemics. Notwithstanding this circumstance, our community was not panic-stricken; the banks continued their functions; the shops were kept open; the streets were daily thronged; in short, business went on as usual, and signs of life were everywhere visible. The number of *cases* of the disease has been estimated by a physician, whose sources of information were ample, at between 20,000 and 25,000 out of a population of about 50,000—say 1 in nearly 2 of the population. And yet the mortality was comparatively *very small;* smaller than is exhibited by the records of any other epidemic disease except the Dengue (by some called break-bone fever) of 1828 and 1850, the number of deaths being 627, or *about three per cent.* The subjoined table shows the weekly mortality during the course of the epidemic:—

For the week ending	Aug.	19,	there were	4	deaths.
"	"	26,	"	20	"
"	Sept.	2,	"	26	"
"	"	9,	"	75	"
"	"	16,	"	127	"
"	"	23,	"	118	"
"	"	30,	"	73	"
"	Oct.	7,	"	54	"
"	"	14,	"	49	"
"	"	21,	"	32	"
"	"	28,	"	24	"
"	Nov.	4,	"	9	"
"	"	11,	"	6	"
"	"	18,	"	3	"
"	"	25,	"	5	"
			Total,	627	"

Natives of Ireland	. . . . .	256
" Germany	. . . . .	131
" remainder of Europe, and West Indies	. . .	78
" United States (generally)	. . . . .	81
" State of South Carolina	. . . . .	33
" Charleston	. . . . .	48

Of these, 612 were whites, and 15 blacks and colored. Of the 48 natives of the city, 43 were whites and 5 blacks; the latter were all children. Of the whites 37[1] were children and 6 adults. Of the white native adults, 2 were between 20 and 30 years of age; 2 between 30 and 40; 1 between 40 and 50, and 1 of the age of 84. The last mentioned resided in the central part of the city, and had never been without its limits in her life. She died with abundant black vomit. Another native white female, not included in the above list, died at the age of 75, likewise with black vomit, as I am informed by a physician who attended her. Of the 15 blacks, 5 were native children, and 10 were adults, natives of other States. No native adult black died of the fever.

The disproportion of the mortality in hospital, to that in private practice is striking, and is to be ascribed to the difference in the *class* of patients, the period of the disease at which they respectively come under treatment, the difference of degree of acclimation, mental and other depressing influences, &c. &c. In the Marine Hospital there were 149 admissions, and 51 deaths; in the Almshouse Hospital, 114 admissions, and 51 deaths; in the Roper Hospital 254 admissions, and 92 deaths; making the average mortality in hospital practice 29 per cent. Whilst the mortality in private practice could not have been the $\frac{1}{2}$ of 1 per cent.

The greater proportionate mortality in low and damp situations, was noticed throughout the prevalence of the epidemic. This may, in part, be due to the influence of the hygrometric condition to which those who inhabit such spots are subjected, and to the want of proper ventilation, whereby the poison is concentrated and rendered more efficient; but, in the conclusion to be deduced from the above mentioned fact, the mode of life, the greater liability, by reason of tribal peculiarity, of the occupants, the *degree* of acclimation, &c. &c., must receive full consideration. Inasmuch as I shall have more to say on this topic in the sequel, I dismiss it for the present.

[1] A larger number than in any other year except 1817, when the deaths of children amounted to 48.

Exceptions to the preservative power of acclimation established by either nativity, a previous attack or long residence, or by two or all three combined, were more numerous in this than in any former year, because it was the most *searching* epidemic that has ever prevailed in Charleston; yet the *relative* immunity was maintained. The protective influence exerted by peculiarity of race and tribe was observed in this as it has been in all other epidemics. Although *positively* a larger number of blacks, both native and non-native, were attacked than in any antecedent epidemic, yet *not comparatively* so to the number of whites, native and non-native, who were attacked. The native blacks who fell victims to the fever were all children; *not one adult black having been known to die of it.* The 10 adult blacks who died were natives of other States. I saw six native adult blacks, in my practice, attacked by the fever, two of them severely; but all recovered. Other physicians report a few cases of the same kind.

The admixture of the blood of the Caucasian with this race, increases the liability to attack and to death, both being in direct ratio with the amount of the former.

White children of all ages were attacked; from three or four months up to 15 and 20 years. In some instances all the children (*i. e.* all under 20 years) of a family were seized; thus, in one native family all the children, seven in number, were sick in different degrees. *Native* children of *foreign* parents, appeared to be more liable than those of *native* parents. This is notaby exemplified in the descendants of the Irish branch of the Celtic tribe, such a degree of exemption as is enjoyed by native children of our indigenous population, being rarely established before the 2d and even the 3d generation. We may, however, possibly err in ascribing to tribal peculiarity, what may in part be due to the irregular habits, and neglect of hygienic laws, generally, which characterize the mode of living of this class of persons.

Several native children who had the disease in 1849 or 1852, had it again this year; a few of the number severely.

Many foreigners (adults) who had suffered an attack of the disease in a former epidemic were attacked again; and in a few cases, recently arrived strangers had it twice during this season. Dr. W. T. Wragg, in a very interesting report to the Trustees of the Roper Hospital on closing, at the cessation of the epidemic, that Institution, of which he was the Medical Officer, says, that several of the patients there treated by him, were identified as having had it in

1852, and two positively asserted that they had it twice before. (*Charleston Medical Journal and Review*, vol. x., No. 1.) But as this question bears some relation to one which will engage us further on, I shall recur to it in that connection.

Age, independently of any other circumstance, seemed to exert, in a marked manner, a protective agency, very few persons, either white or black, native or foreign, acclimated or non-acclimated, being attacked after the climacteric period of life, say after 45 or 50 years of age.

The fatality of the disease was, in general, in direct ratio with the insidiousness of its invasion. I have seen patients, both old and young, but chiefly the latter, who would present symptoms indicative of nothing more than *malaise*, upon which, after they had lasted an uncertain time, collapse would abruptly supervene, followed by death. On the other hand, when the onset was violent, when, in other words, the disease exploded, its force was soon expended, its duration being, as the rule, short, and the termination favorable.

The proportion of recoveries after black vomit was greater than at any former prevalence of the fever. This terrible symptom is no longer considered as almost certainly indicative of a fatal issue, the proportion of recoveries after it having steadily increased in each succeeding epidemic since that of 1835. This year (1854), in the Roper Hospital, of 74 who had it, 9 recovered. Such recoveries were more frequent in private than in hospital practice, in children than in adults, and according to the period of the disease at which it was thrown up; the earlier the greater the prospect of recovery. Many native children threw it up within the first 24 and 48 hours, and recovered. In this connection may be considered the question: To what is due the greater mortality attending the ejection from the stomach of the substance called "black vomit" than that attending the passage of the same fluid by stool, notwithstanding that a much greater quantity of blood may be lost by the latter than by the former outlet? To this question, I confess that I am unable to give a satisfactory answer. There can be no doubt that in a great many, if not in all the cases in which this altered blood is passed through the bowels, it is poured into the stomach, as well as into the intestinal tube, numerous autopsies having revealed its presence in the former, as well as in the latter viscus, where no vomiting had occurred. I would suggest, in explanation of this phenomenon, the probability that the *act of vomiting* (involving nervous

prostration at a time, generally the latter stage of the disease, when the patient is illy able to bear it) is the cause, were it not, in the first place, for the fact that, in some cases, the individual vomits but once or twice before he dies; and, in the second, for the circumstance that, in most cases, black vomit is thrown up by *apparently* a spasmodic contraction of the stomach, diaphragm, &c., and without much, if any, general muscular effort and nausea; retching being rarely observed to accompany it.

Of the *nature* or composition of black vomit, concerning which so much has been written, I have nothing, derived from my own investigations, to report. I avail myself, however, of the statement of the results of microscopic examinations of this fluid made by Dr. F. T. Miles, in conjunction with Dr. J. T. Porcher, furnished to Dr. J. J. Chisolm by the former gentleman, and embodied in his able report on the epidemic in the *Charleston Medical Journal and Review*, vol. x., No. 4.

"1st. The acidity of the fluid vomited in yellow fever is always marked, and, as I am disposed to think, varies in intensity with the gravity of the case. The bluish-white fluid (sometimes called *white vomit*) occasionally vomited in the early part of the last stage of the disease, only wants the admixture of blood to resemble perfectly in its constituents the black vomit, which it usually precedes. The bluish tint strongly reminds me of that described by Beaumont, as produced by the admixture of saliva and gastric juice. The determination of the particular acid which gives the reaction to the fluids presents great difficulty. We were disposed to doubt the presence of free hydrochloric acid, as we distilled over with the water-bath two-thirds in bulk of the fluid without finding a trace of acid in the fluid in the receiver.

"2d. Although I think we must unhesitatingly attribute the coloration of the vomit to the hæmatin of the blood, acted on by the acid fluid, nevertheless, in the majority of specimens examined, embracing those most deeply colored, *blood corpuscles were but rarely found among the solid particles which abound in the fluids.* These corpuscles, when examined either singly or grouped in small masses, appeared very pale, as if deprived of their coloring matter, having a perfectly smooth, regular outline, and no appearance of corrugation. In exceptional cases, in which blood corpuscles are found predominating, they still retain their normal outline.

"3d. In every specimen of the vomit examined, when a portion of the characteristic "coffee-grounds sediment" was placed under

the microscope, it was seen to consist of a striated mucus entangling a very great number of highly refracting particles, with outlines varying more or less from the circular. These particles, the constant presence and very great number of which attracted our special attention, we came decidedly to the conclusion, were the slightly altered nuclei of ruptured cells, some of which were, doubtless, yielded by the squamous epithelium and common mucous globule. But we convinced ourselves, by repeated and careful observation, that the vast majority were derived from the *oval granular cells, which fill the stomach tubes, the Peptic or Rennet cells of Kölliker.* The complete peptic cells were not unfrequently observed once or twice, several together, exhibiting a cast of tube from which they had been expelled.

"4th. The minute structure of the stomach appeared to have undergone *no* alteration, the superficial cylindrical epithelia presenting their normal appearances and position. Only once or twice, in the course of our observations, did we see a cylindrical epithelium in the field of the microscope. The stomach tubes were packed with peptic cells, as I have always seen them in the stomachs of animals killed during digestion, and once saw in the stomach of a criminal, who had taken food a short time previous to his execution. A strongly marked congestion of the capillaries was seen in parts of the stomach, but this was far from being universal."

Prominent among the *exciting* causes of the disease were a wetting by rain and sleeping in the open air, either under an awning, or without any covering overhead. Almost all who were seized on shipboard stated, that on account of the heat and the mosquitoes in the cabin, they slept on the decks of their respective vessels, some under an awning, others without covering. There can be no doubt that the disturbance of the equilibrium of the functions induced by the check thus given to the cutaneous transpiration is an immediate cause of the attack of the disease. The *materies morbi*, in this as in other zymotic diseases, may be received into the system; but, its removal in a state of functional activity of all the excretory organs going on, *pari passu*, with its introduction, it would, perhaps, in many instances, not accumulate in sufficient quantity to produce an attack of the fever. But the function of one of the great emunctories for effete matters being suspended, the specific poison acts upon the fermentable substances thus re-

tained, and fermentation or zymosis is established, and the disease developed.

The shortest time of exposure to the poison of yellow fever, followed by the effect, was *somewhat less than two hours.* A negro from one of the neighboring islands visited the city, during the course of the epidemic, did not remain quite two hours, returned and died of the fever with black vomit, a few days after. Dr. Frost (*Charleston Medical Journal and Review*, Vol. x., No. 1) refers to a case which occurred in Mobile, Alabama, in which the time of the exposure was nearly as short. A countryman drove his cart into Mobile, stayed two hours, returned to his home, took the fever, and died. Cases in which exposure of one and two days sufficed to produce the fever, were not uncommon in Charleston.

The time intervening between midnight and 6 A.M., was the period of the 24 hours at which the disease, generally, invaded. This fact was accurately ascertained in a great number of cases.

With a view to its *prophylactic* effect, the sulph. quinine was made extensive trial of, and utterly failed so far as my own observation, confirmed by that of others, went, in averting the fever; at least, as far as may be inferred from the number who were seized by the fever, notwithstanding they took this alkaloid. This therapeutic fact furnishes a strong argument in opposition to the doctrine of unity of cause, and consequently of nature of periodical and yellow fevers.

Yellow fever forms no exception to the general rule, that in all diseases the pathology of which is obscure, the treatment will be infinitely varied; the therapeutics of each practitioner being founded upon the opinion which he holds in reference to its nature. The inflammatory, or quasi-inflammatory state, which the fever presented in times past, having been substituted by the hemorrhagic and more decidedly adynamic conditions, the change has given rise to a modification of treatment, in one respect. Abstraction of blood, both local and general, has been abandoned as extremely prejudicial, and corroborants and stimulants are employed more freely. It may be said, indeed, that the profession of the city has, generally, settled down upon the opinion long since promulged by Pitcairn, respecting common continued fever (typhus and typhoid), viz: that yellow fever cannot be *cured*, but *may* be *conducted* to a favorable termination.

The plan of treatment generally pursued, was to evacuate the bowels at as early a stage of the disease as possible, by means of a

mild cathartic, say calomel, or calomel and rhubarb, followed by Epsom salts or castor oil, care being taken to avoid ptyalism, for the reason that this condition, when induced accidentally by some, or designedly by others, seemed to be decidedly hurtful. Dr. Chisolm, in the report above referred to, states that three persons, members of the same family, who were salivated, had profuse hemorrhage from the mucous surfaces which, despite of all remedial measures, caused death. A case was admitted into the Marine Hospital, under my care, so profusely salivated by the master of the vessel to which he was attached, that his tongue protruded considerably from his mouth, rendering deglutition of both fluids and solids impossible, and even impeding respiration. This patient died in about five days after his admission, exhausted by the copious hemorrhage from the buccal cavity, and inanition combined.

Neutral mixtures were prescribed to act upon the skin and kidneys; blisters to relieve gastric irritation; opium in some form to allay jactitation and induce sleep; ice in pellets, and, when tolerated, ice water *ad libitum* was allowed. The wet sheet or packing plan was employed in some cases, but without satisfactory results.

For my own part, having been for many years impressed with the necessity of early support being afforded the vital powers in all forms of continued idiopathic fever, until, and to the end that the crisis be passed, in this epidemic, I placed my reliance, in regard to obviating the tendency to death, and thus conducting the disease to a favorable issue, upon aliments, as soon as they were tolerated by the stomach, and stimulants. Of the former, beef tea (essence of beef), chicken and veal broths, and milk, were given at stated intervals, and in quantities regulated by the state of the system, the tendency to irritation of stomach, &c. The latter were employed on the principle laid down by Dr. R. B. Todd, in his mode of treatment of the continued fever of Great Britain, viz., in such doses, and at such intervals, as would keep up the *stimulant* without allowing the secondary or *depressing* effect to occur. With this purpose, I ordered, according to circumstances, one or two tablespoonsful of brandy, to be given every hour or two hours, combined or not with milk. One patient, whose case was marked by such excessive gastric irritation that everything of a medicinal character, even when put upon the tongue, as calomel, increased the vomiting, would, I verily believe, have died, if I had persisted in attempts to introduce medicinal substances into the system. Seeing him cold and clammy, and rapidly failing, I ordered a discontinuance of all

medicine, and beef-tea and brandy to be given. He retained the first dose of these substances, and, on its being repeated several times, he became warmer, and stronger; the gastric irritation did not return, and he rapidly recovered.

Convalescence, usually prompt and rapid in this fever, was generally tedious and protracted. It extended, in some cases, to six months; the systems of the patients being left dilapidated in a remarkable degree. The rawness produced by vesication—it mattered not by what means, by cantharides, aqua ammonia, or a mineral acid—was long in healing, and the part not unfrequently sloughed, demonstrating the loss of plasticity which the blood had undergone.

The view which refers the seat of the fever to the great sympathetic nerve, or the nerve of organic life, seems to me to be erroneous. That the sympathetic system is involved, and even prominently, in the morbid action, appears to be indisputable; but that the first impression of the specific poison is upon the blood, constituting the first link in the chain of phenomena of the disease, is inferable from a variety of circumstances. The scope of this report not admitting of a lengthy consideration of them, I shall content myself with mentioning a few.

1. The analogy of character which the yellow fever presents to diseases (such as variola, scarlatina, &c.), arising from a specific poison of animal nature, in attacking, as the rule, but once, and in the impossibility of arresting it, or cutting it short (which I think proved beyond a reasonable doubt), is a strong argument in favor of the poison of this fever acting (like those of the eruptive class) first upon the blood.

2. If it be proved (which is not the case) that common continued idiopathic fever (typhus and typhoid) has its seat (or have their seats) in the sympathetic system, it would show that this nerve is not the *peculiar* seat of yellow fever, but that it is the seat common to them all.

3. An attentive consideration of the phenomena of idiopathic fever in general, of every variety, will show that the secretions are notably affected, some being perverted, and others checked. This derangement of the secretory and excretory processes is as well marked, though in minor degree, in intermittent and bilious remittent as it is in typhus, typhoid, and yellow fevers, which proves the implication of the sympathetic nerve in the former as well as in the latter. In typhus and bilious remittent fever, the deterioration of the blood is sometimes quite manifest, being denoted in the former by

subcutaneous hemorrhage, and, in the latter, by the occasional ejection from the stomach of a black fluid resembling the black vomit of yellow fever. There are very few, at the present day, who are disposed to deny that even intermittent fever is a blood disease, inasmuch as catalytic and hæmatic medicines are frequently required for the removal or neutralization of the poison, and the restoration of this fluid to a healthy state.

4. And lastly. It seems that, if that theory be correct, it is necessary to admit the partial dependence, at least, of the blood for its vitality and integrity upon the sympathetic nerve; since, if, as that doctrine maintains, the primary impression of the specific poison be made upon this nerve, the intoxication of the blood, and the derangement of secretion and excretion, result from the impression conveyed to the different organs. These facts and arguments, among many others that might be adduced in support of the negative of the subject, lead to the conclusion that the blood is primarily the recipient of the poison; that the fermentation, or zymosis, thus set up, eventuates in all degrees of disorder, from simple change, absolutely or relatively, of one or more of its constituents, up to death of the whole fluid; that in proportion to the *degree* of inquination, will be the ravages created in the system; that the organic processes, nutrition and secretion, become perverted or suspended; that the nervous system, that of organic as well as animal life, receives its quota of injury; and lastly, that the blood thus altered in constitution becomes a foreign body, which must find an exit from the system through the various channels provided by nature for the escape of noxious matters, which emunctories are the liver, stomach, and bowels (indeed, the mucous membrane wherever it exists), skin, kidneys, &c. Secretion and excretion, and nutrition, are no more disordered in yellow than in typhus and typhoid fevers; nor more than in intermittent and remittent, *in proportion* to the *degree* of disorder produced by the poison (malaria) upon the blood; that of the former, which is probably of animal nature, being greater than that of the latter, which is of vegetable origin.

In the case of all diseases resulting from a specific poison, especially that of animal nature, the difference of effect depends upon the difference in the *nature* of the poison. In this way may be explained the circumstance that, in the class of eruptive fevers, the prominent phenomena manifest themselves in the skin and mucous membrane, whilst those of the idiopathic fevers, continued and periodical, in the derangement of the constitution of the blood.

Thus, likewise, may be explained the minute shades of difference, in their phenomena, exhibited by typhus, typhoid, and relapsing fevers. The *law* governing the action of poisons seems to be that one poison shall act in one way, and another in another and more or less different way, the operation of no two, whether animal or vegetable, being exactly alike.

As in other epidemics, it was a difficult matter to decide how many types of fever prevailed simultaneously with the yellow fever. This is a question pregnant with interest, but inasmuch as its consideration would involve a long discussion of theories (such as the identity or non-identity of yellow and bilious remittent fevers, their mutual convertibility, &c.), which, in the present state of the science, would be unprofitable, I shall merely state that opinion was divided on the subject, some maintaining that typhus and typhoid, bilious remittent and intermittent, prevailed at the same time with yellow fever, whilst others recognized the fever as one and the same disease. It is possible that, in the present instance, both parties are right as far as their observation, respectively, went; for cases of bilious remittent, intermittent, and typhus, were not very numerous, certainly not so numerous as to entitle them to be called epidemic, and so may not have fallen under the notice of those professing the latter opinion; and when typhus occurred, it was, in the majority of cases, consequential of yellow fever.

Cases were not uncommon in which, after the patient had passed through an attack of bilious remittent or intermittent, he contracted yellow fever, and *vice versa*, several days intervening to remove all doubt of the fact. Again, cases occurred in which the blending or intermixture of type was well marked, the periodical element requiring quinia for its relief. But, as the rule, there was but *one* fever prominent, and absorbing all others; the fact having been, from time immemorial, observed of the individuality of the original type being lost or masked by being merged into (rather, blended with) the more grave malady.

In this connection may with propriety be considered the subjects of the significance, in etiological and prophylactic points of view, to be attached to what is called "ephemeral" fever, and of second attacks of yellow fever. That *all* fevers, not distinctly referable, on the one hand, to the periodical (intermittent and remittent), and, on the other, to typhus and typhoid, which prevail at the same time with yellow fever, are to be classed with it, to be considered as part and parcel of it, is subject of reasonable doubt. I have no hesitation

in admitting that the *majority* of cases of "ephemeral" fever—a form of fever presenting the mild features of yellow fever—are really of that nature, for there are mild cases of yellow fever as of any other disease. But there is a certain proportion of cases in which, after the patient has had one attack, say of a day's duration, he recovers, and in a longer or shorter time is again attacked; it may be in the same degree of mildness, or it may be that the fever, being more severe, and continuing beyond 24 hours, is developed into unmistakable yellow fever. The difficulty in deciding the question as to the nature of the first fever resides in the circumstance that the differential diagnosis in the first 12 or 24 hours of yellow fever, bilious remittent, intermittent, and symptomatic fever from transient cause of irritation, is frequently doubtful, by reason of identity of symptoms. In the circle of my practice, I saw several patients who had the mild and short attack first, and were afterwards attacked severely with well-marked yellow fever; others, fewer in number, had two attacks of the mild fever, and then the violent form. I saw a family, consisting of mother, daughter, and two sons, nonnatives of the city, but several years resident in it; the mother had *one* attack, the daughter *two*, one son *two*, and the other son *three* attacks, the last or third attack of the second son proving fatal, with black vomit. Now all of these attacks were violent, but none, except that which terminated fatally in the case of the second son, lasted beyond two days, and did not present a remission, but a gradual decline. In the case of a little boy, the son of a lady who is a native, but who himself was not born in the city, who took, during his father's illness with yellow fever, a violent form of fever, the fever passed off in 24 hours, and two days afterwards he felt well enough to play about the house. Hearing the mother express her thankfulness that he had passed through the yellow fever, I warned her against indulging the expectation that he would not be attacked again. In the course of a week, he was again seized with fever, of the nature of which this time no doubt could be entertained. He threw up black vomit in great quantity during four days, but ultimately recovered.

The necessity is thus forced upon us of taking the one horn or the other of the dilemma; we must either admit that a mild attack of yellow fever does not protect the system from another attack, by exhausting the susceptibility to further impression, or that they are cases of aborted intermittent or remittent, or of symptomatic fever from transient cause, such as crudities in the alimentary

canal, exposure to high solar heat, &c. &c. If the first be taken, then the cases of second attacks of yellow fever are quite numerous; if the second, they are rare. Hence may arise disappointment, and consequently loss of confidence in the protective agency of one attack, from the impossibility, in some cases, of making a correct diagnosis of the fever. Hence, again, the importance of a guarded assurance of future immunity after an attack of the mild and ephemeral form of fever, especially in the cases of strangers, for it is chiefly, if not wholly, among them that these attacks are observed.

Having thus briefly sketched the general features of the epidemic, I reserve for consideration, in the last place, the point by far the most important in its history, and which is of paramount issue at the present day, viz., its origin.

One of the most difficult problems in the whole range of medical science is to determine in a given disease what is the *causa causans*, or *generating* cause, and what the *causa sine qua non*, or that without which the first would be inoperative; in other words, to distinguish between that which is *essential* and that which is *accessory* to the causation of disease. It is generally far easier to say what *is not* than what *is* the cause of morbid action. From this obscurity pervading the etiology of disease in general, yellow fever is by no means exempt.

Fully sensible of the difficulties attending such an investigation, I shall proceed to examine the validity of some of the prominent alleged causes of yellow fever in reference to their separate or united capability of giving origin to the epidemic of 1854.

And first of terrene conditions:—

The city boasted, as above stated, of an average degree of cleanliness; the offal was removed from the streets with accustomed regularity daily, and there was no stagnant water in them. Mud lots, particularly in the western part of the city along the Ashley River had been reclaimed and filled with sawdust, rice chaff, and other fermentable substances, together with the offal and garbage of the streets. These fermenting and decomposing materials exhaled, as may readily be supposed, the most offensive odors. But it is known to all the residents of the city, that the same process has been going on for many years past, during seasons when the fever *has not* prevailed, as well as when it has.

In 1853, a *healthy* summer, the portion of Rutledge between Broad and Beaufain Streets, being made of animal and vegetable sub-

stances in all stages of decay, gave forth such offensive odors that the inhabitants of the neighborhood were forced to close the doors and windows of their respective houses exposed to them. I have repeatedly seen flocks of turkey-buzzards disputing the animal refuse of the markets deposited in this spot. Now, were the emanations from these putrescent masses capable of themselves of generating yellow fever, it surely would have proceeded from such a hot-bed as this place was. And it is well known that, during the last twenty years, the extension of Broad Street towards the Ashley River, and of Lynch Street to connect with the former, across mud flats, has been steadily going on, under the direction of the city authorities, the filling being made with the contents of the scavengers' carts, notwithstanding the protests and remonstrances of the occupants of the neighboring houses situated to the north, whose olfactories were constantly assailed by the stench proceeding from it. Yet so far from yellow fever *originating* here, *this neighborhood had never even been visited by it before the summer of* 1854.

When treating of the mortality, I stated that the disease attacked at an early period and bore with severity upon two spots in particular; which circumstance seemed to favor the view of the causative agency residing in terrene conditions. To these spots I will now refer. The one is in Calhoun Street, between Elizabeth and Meeting. It is here that a case of yellow fever (case of Mrs. Gorham) occurred on the 15th of August. Now, lest it be inferred that this spot had any agency in originating the disease in this case, I will mention that it has been reclaimed from the salt water for so long a time that the houses first erected upon it are tottering to their fall; and that it was in no worse state hygienically in 1854 than it had been in any previous year when yellow fever did not prevail; moreover that *it has rarely been visited by it.*

Again: by reference to the dates and order of succession of the cases, it will be seen that Mrs. Gorham was attacked eight days after the first seaman was sent to the Marine Hospital from the Sullivan, and at a still later period than those who were sick on board the Columbus.

The other spot, situated westward of Franklin Street, and opposite to the Marine Hospital, has been recently reclaimed and built upon, having a narrow alley leading to it. This is one of the places alluded to in the earlier part of this report, as exhaling, by reason of being filled with offal and garbage, most disagreeable odors. But did the first cases of the fever originate here? No; notwithstand-

ing that it had the very population (recently arrived Irish) most obnoxious to the disease. It was not until two weeks had elapsed after the first cases occurred on ship-board, and not until 15 or 20 patients laboring under the fever had been received into the Marine Hospital, about 50 yards distant, that it made its appearance among the occupants of these houses.

Did I deem it necessary, I could multiply cases of this character, by which the connection between telluric conditions and the origin of yellow fever is disproved. And these observations, as concerns Charleston, are amply corroborated by Drs. M. Dowler and McFarlane, in respect of the behavior of the fever in New Orleans; the disease *never* showing itself *first* in those localities in which heaps of matters in a state of fermentation and decomposition exist, but invariably among or in the neighborhood of the shipping.

But in admitting that the conduct of the fever in Charleston, as regards the number of cases and the mortality, being proportionally greater in low moist spots, than in other parts of the city, of different hygienic conditions (as the sand-ridges), corroborates the "law of cholera" established by Mr. Farr, of Great Britain, as applicable to all zymotic diseases, we must not overlook and forget to estimate at its true value the fact that, by reason of low rents, &c., the class of people, in all cities, who inhabit such spots is precisely that which is the most susceptible of disease in general, and in an especial manner of *epidemic* disease. It is the laboring class, upon whom the curse of poverty—one of fearful magnitude—presses with iron hand; in whom there is utter hopelessness of change of condition for the better; in short, in whom are united and intensified all the influences, moral, mental, and physical, which contribute to make up the sum of human wretchedness and woe—this is the class which, thereby rendered extremely liable to morbific impressions, inhabits such abodes. Mr. Farr has thus erred in ascribing even the propagation or diffusion of cholera and other zymotic diseases, in such places, to telluric and hygrometric states only; he has apprehended the truth, but not the *whole* truth. He has ignored not only the mode of living, habits, &c., of the people, but also the foulness, the inquination of the air which necessarily attends overcrowding. But, in laying stress upon these conditions as active in the *spread* of cholera, he does not imply that its *causa causans* is therein generated.

Examples without number might be cited in which yellow fever has decimated towns and villages situated on high and dry sandy pine-land ridges, in which the soil is so porous as to allow of the

prompt percolation of water. The work issued by the Sanitary Commission of New Orleans, on the epidemic of 1853, alone contains numerous cases of this complexion.

At the commencement of this report, it is stated that there had been no excavation or upturning of the soil, for any purpose whatsoever; an ordinance, prohibiting the disturbance of the earth from the 1st of May to the 1st of October, having been passed by the City Council two years before, and consequently being then of force. There existed at the time of the outbreak of the epidemic, no terrene or other local cause, detectable by the eye either of the profession or the laity, capable of explaining its first appearance at Central Wharves docks. The new Custom House in process of erection, which is situated on the wharf adjoining the Central Wharves on the north, had risen to the height of 15 or 20 feet above ground, and all excavation, piling, &c., had ceased eighteen months previously. But, in order to show in a stronger light the improbability that it exerted an influence in the origin of the fever, I will state that minute inquiry was made relative to the time at which the laborers (chiefly Irish) at this edifice begun to be attacked, and it was ascertained that two weeks had intervened between the first cases which occurred on the ship Sullivan and other vessels, in the above-mentioned docks, and the first among these workingmen; that is to say, after the disease had appeared in different and remote parts of the city. Another circumstance connected with the construction of this edifice is strikingly confirmative of the principle for which I am contending, viz., the want of relation as cause and effect between excavation and upturning of the soil, and the origin of yellow fever. In 1852, when yellow fever prevailed in this city, the excavation and pile-driving for the north wing of this building were going on, 21,000 cubic feet of mud, &c., having been removed, and the concrete laid, by the 5th of August; yet the laborers did not begin to be attacked until some time after the disease had existed in the city, and even then but 15 out of 200 (196 of them being Irishmen) took the disease, five of whom died, according to the pay-roll of the engineer, and the record of deaths in the City Registrar's office. (Dr. Wm. Hume, *Charleston Medical Journal and Review*, Vol. x., No. 1, p. 5.) During the same period of the year 1853, 143,000 cubic feet of earth were excavated, and remained in a heap upon the premises; 200 Irish laborers were employed on it in August and September, and yet not a case of fever occurred among them. (Dr. W. Hume, *ibid.*, Vol. ix., No. 6). The second pit, excavated for a gasometer, was situated on King

Street, near Vanderhorst. It was begun in May and finished in November, 1849, a yellow fever summer; yet the neighborhood was exempt from the disease, the nearest case being that of a German apothecary, residing on King Street, about 200 yards distant, who had been into the infected part of the city. During the summer of 1853, a third gas-pit was dug in Cannon Street. This was a remarkably healthy season; I saw a few cases of bilious remittent in its vicinity, but no cases of yellow fever. Moreover, the deepest and most extensive excavations ever made in Charleston were carried on throughout the summer of 1848, viz., those for the gasometer in Church Street, and for laying the pipes through the whole city; yet a healthier summer has rarely if ever been known.

At the foot of the fish-market, in the dock adjoining the Custom House on the north, lies the recently constructed receptacle for live fish. During the summer of 1853, the digging out of the mud, and the laying with "concrete" went on, but no case of yellow fever occurred among the workmen employed on it, and it was completed in 1854, two months anterior to the outbreak of the epidemic. Up to the 19th of August (the date at which inquiry was made, and two weeks after the fever had appeared among the shipping), none of the operatives had been attacked.

Let us now turn our attention to the alleged connection between meteorological states, and the origin of the yellow fever. The summer of 1854 was, I have stated, excessively hot, the heat being of a parching character—sirocco-like. The breeze, prevailing as it did, almost the whole time from the land, was unrefreshing. But that heat is not the generating cause of the fever, is shown by the following table, for which I am indebted to Dr. J. J. Chisolm (*Charleston Medical Journal and Review*, vol. x., No. 4).

Range of Thermometer in the Shade.

	1849.			1850.			1851.			1852.			1853.			1854.		
	Ext's.		Mean.	Ext's.		Mean.	Ext's.		Mean.	Ext's.		Mean.	Ext's.		Mean.	Ext's.		Mean.
January	72	43	58	74	53	64	69	44	61	67	35	55	69	43	58	73	45	59
February	72	42	58½	69	47	61	75	46	65	74	52	62	69	50	61	71	49	61
March	75	55	65½	76	54	65	75	58	66	76	53	65	74	48	63	80	54	68
April	80	55	70	82	59	68	79	60	70	81	57	67	84	61	71	80	52	69
May	83	64	76	86	69	76	88	65	77	87	62	78	84	68	76	84	60	76
June	90	77	81	88	70	80	89	69	81½	89	72	79	88	74	81	94	62	80
July	90	74	82	93	82	86	94	80	84½	89	79	84	90	79	84	95	78	84
August	91	78	84	92	81	85½	91	74	84	88	73	82	90	76	83	94	78	85
September	87	72	78½	90	71	80	87	63	78	85	71	78	88	67	79	89	68	81

It will be seen by the above table, that the mean temperature of the yellow fever summers, 1849, 1852, and 1854, did not materially differ from that of the healthy summers of 1850, 1851, and 1853; that it was rather higher in the healthy summers of 1850, 1851, and 1853, than in the two yellow fever years of 1849 and 1852; and, in the healthy summer of 1850, the range was higher than in the yellow fever summer of 1854. Besides, it is only necessary to adduce the exemption of many places within the tropics, and of Boston, New York, and Philadelphia (in which cities the thermometer ranges, during the summer months, from 95° to 105°), to prove that heat alone cannot generate the fever.

By reference to the subjoined table, for which I am likewise indebted to Dr. Chisolm, the quantity of rain which fell during the same periods, in inches and quarter inches, will be seen:—

	1849.	1850.	1851.	1852.	1853.	1854.
January . . .	0.1.3¾	1.3.8½	3.1.1	0.0.1½	0.3.3½	3.0.7¾
February . . .	1.1.6¼	1.2.8¼	3	2.0.4	1.3.7¼	3.1.0
March . . .	1.0.2¼	4.3.4	1.1.5	2.0.1¼	3.0.6	0.3.4
April . . .	0.0.2½	1.2.3	0.3.8	4.2.3	0.0.2¾	1.1.6
May . . .	3.0.7¼	2.2.1	1.2.4	2.2.8½	2.0.0¼	7.0.8½
June . . .	2.0.8¼	0.0.1¾	7.0.2	4.2.6¼	3.2.4¾	2.2.5¼
July . . .	7.3.2¼	0.2.4½	5.2.7	6.3.4	10.2.0¾	7.1.3¼
August . . .	4.3.4	4.2.1¼	4.1.6	3.2.2	5.1.0¾	2.3.1
September . .	6.1.3½	1.2.6¾	0.3.0	11.0.5½	12.3.3¾	9.3.8

Whereas three years of this table exhibit the coincidence of much rain with the prevalence of yellow fever, the two healthy years, 1851 and 1853, show the *want* of that coincidence. Besides, anterior to 1849, excessively wet summers have been healthy; so that the relation of this meteorological state to the origin of the fever is clearly disproved.

With regard to the causative agency of the dew-point, little need be said. It varies very slightly in a series of years, being almost uniformly over 70°.

But if telluric and meteorological states cannot separately produce yellow fever, may not their combined operation generate it? This question must receive a negative answer from the account of those states above given, as relating to Charleston alone, without appealing, for proof of the same character, to the history of numerous places within the torrid and lower part of the temperate zones, where the same conditions are united, without yellow fever being seen. Moreover, the disease has existed where the terrene states

were wanting, even though the meteorological may have been present. (*See* the "Report of the Sanitary Commission of New Orleans, 1853," *passim.*) Of themselves, therefore, either singly or variously combined, they are totally inadequate to *generate* the poison of yellow fever, and the only agency which can reasonably be claimed for them is that of giving efficiency to the specific cause by rendering, in virtue of their peculiar influences, the system susceptible of being impressed by it. They can hold no other relations to the fever than those of antecedents, predisponents—adjuvants simply—of more or less power, their morbid influences being manifested in depression of the vital powers, and in obstruction offered to the proper depuration of the blood of the products of decomposition. Thus, *terrene conditions*, which are generally associated with those of *overcrowding* and *filth*, compel those who are subjected to them to breathe an atmosphere charged with carbonic acid, and laden with putrescent emanations; a *high dew-point* interferes with the pulmonary and cutaneous respirations, whereby the perfect decarbonization of the blood is prevented, and languor of mind and debility of the muscular system is induced by imperfect oxydation of decomposing azotized matters; *heat* relaxes, enervates the system, decreases the number of pulmonary respiratory acts, and thus favors the retention and accumulation of carbonaceous and nitrogenous matters in those who take more of these elements in the form of food than is physiologically required, and finally reduces the capacity of the system to react upon and expel the morbific cause. The morbid matters received into, and retained in the blood in these several ways, render it fermentable; in other words, place it in a condition favorable to be acted on by the specific poison when introduced.

Of these antecedents or adjuvants, heat seems to be by far the most potent; indeed, numerous circumstances lend support to the belief that it is the *only* efficient condition—the *causa sine qua non*—in the production and extension of yellow fever. Examination of the Report of the Sanitary Commission of New Orleans, already referred to, reveals the fact, that in all the localities in which yellow fever prevailed, respecting which information was obtained, *the only condition uniformly present was a high degree of heat;* in respect of all other conditions, they differed widely.

A case of yellow fever, in the person of a seaman who came from Key West (where the fever was prevailing at the time), in the steamship Isabel, on the 11th of May, was treated by me in the

Marine Hospital. The patient threw up black vomit freely, during several days consecutively, but recovered. The mean temperature being so low (below 80°) as to excite no fears of its spread, isolation of the sick man was deemed unnecessary. No cases occurred in the ward in which he lay. At a later period of the season (July and August), however, when the mean temperature was above 80°, the introduction of a few cases, and of the impure air of the holds of the vessels from Havana, was sufficient to create the disease; it was like the spark applied to the magazine.

Evidence corroborative of the agency of heat in giving efficiency to the poison, is to be found in the cessation of the fever before frost (which happened in 1854 and in several other seasons), that is, when the temperature is so much lowered that the poison is inoperative. Again, the capacity of accommodation of system to a very high temperature without injury, may enable us to explain, in part, the comparative insusceptibility of yellow fever exhibited by the negro race.

The conditions, terrestrial (including overcrowding, &c.) and meteorological, present in Charleston in 1854, having been found inadequate to account for the *origin* of the fever, but one other possible mode remains to be adopted, and that is, its importation from abroad.

Whatever may be said of the origin of the disease in other parts of the world, it is a striking fact, as regards Charleston, that it is *not until some time after* the arrival of a vessel or vessels from a port or ports where yellow fever is prevailing, generally with a case or cases of the fever on board, that it breaks out in the city. The history of the prevalence of the fever in this city, during the last 150 years, proves that it is only when the intercommunication of Charleston and the West Indies has been considerable, that the disease has shown itself here. At times when—as during the Revolutionary war and that of 1812—intercourse with these islands was suspended, the city enjoyed an exemption from it. No sooner was the embargo act of the last war repealed, and the course of trade with the West Indies resumed, than the fever reappeared. The summer of 1817 was a fatal one. It showed itself again in 1819, 1824, 1827, &c.

That the fever of 1854 was likewise imported, will appear from the following considerations:—

1. In the sketch of the commencement and progress of the epidemic, given in the early part of this report, it has been shown that the first three cases occurred in passengers and a seaman of vessels

directly from the port of Havana, viz., the steamship Isabel, and the Spanish polacre Columbus; and that other cases of very suspicious character occurred on board of the latter vessel and the Concha.

2. That the fourth case occurred in the person of a seaman attached to the ship Sullivan, one of a regular line of packets between New York and this port, which arrived on the same day (July 21) as the Columbus and Concha from Havana, and lay in dock with the former vessel, on board of which one man had died at sea, and another died of yellow fever a few days subsequently to her arrival in port. By reference to the accompanying cut, the relative position of the vessels, while in dock, will be seen.[1]

The Sullivan and Columbus are in the same dock, separated about thirty feet; the former vessel northward of the latter. The Concha lies in the dock next above, but at the same wharf with the Sullivan, the width of the wharf only intervening. Thus was the latter vessel (the Sullivan) placed, so to speak, between two fires. The Spanish vessels remained, the one seven and the other nine days, in close proximity to the Sullivan, and then sailed. On the 4th of August (a reasonable period for the incubation of the disease), one of the crew of the Sullivan was attacked, and came under my care in the Marine Hospital. Two days after, two more of her crew were sent to the hospital.

On the 22d July (the day after the arrival of the Spanish vessels), the brig Iris arrived from Rockland, Maine, and lay in the dock adjoining, above, that in which lay the Concha. (See wood-cut.) After lying there eight days, she hauled, August 1, into the Ashley River, on the western side of the city. On the 6th or 7th August, the captain was seized by yellow fever, and admitted into the Marine Hospital on the 10th.

On the 7th of August, Mr. F. S., clerk to Hall & Co., the consignees of the Concha and Columbus, was attacked by the fever. The office of Messrs. Hall & Co. is on the wharf at which the Concha was moored. Mr. S. not only visited that vessel several times, but even took one or more meals and a *siesta* on board.

On the 7th of August, the schooner Monterey arrived from Philadelphia; on the 8th, the schooner Susan Cannon, from Baltimore; on the 9th, the schooner Maryland, from Baltimore; on the

[1] A mistake has been made by the lithographer in writing "Market Wharf," instead of "Custom House Wharf."

9th, the schooners J. P. Brown and Henry Nutt, from Philadelphia. These vessels lay at Central Wharves, from which the Spanish vessels had recently sailed; and, within ten days after their arrival, one or more men from each of them were sent into the hospital with yellow fever.

The brig Emily, from New York, arrived, August 8th, at Accommodation Wharf, the same at which lay the Columbus; the width only of the wharf separating them. (See wood-cut.) On the 15th, one of her crew was attacked, and entered the hospital on the 18th.

The schooners Yorktown and Maine Law, from Philadelphia, arrived, on the 9th August, at Central Wharves. Two men from the former, and the whole crew of the latter, were admitted into the hospital within ten days after their arrival.

After this plain and impartial statement of facts, can any be found to deny that the disease was introduced into the city from without, and that thence was diffused the poison? This was one of the centres from which it radiated; another remains to be mentioned.

3. The barque Aquatic sailed from Matanzas, Cuba, for Cork, Ireland, on the 25th of June, with a cargo of molasses. On the 3d of July one of the crew, and on the 4th another, was attacked with fever, and died. A few days after, several more men were attacked. About this time, she sprang a leak, and the remainder of the crew being more or less disabled, the captain ran her ashore near Georgetown, S. C. She was then towed into Charleston Harbor; the crew, although not at the time sick, were sent to the lazaretto on Folly Island, and she came up to the city to North Commercial Wharf on the 13th July, with her hold in a very foul condition, containing molasses in a state of fermentation, bilge-water, &c. After lying at this wharf two days, she went up to Dry Dock Wharf, where she was pumped out, and means were taken to disinfect her.

On the 16th of July (the day after the Aquatic went to Dry Dock Wharf, and before she was disinfected), the barque Vesta arrived from Boston, and went into the same dock in which the Aquatic was lying, the distance between them being about thirty feet.

The steamship Isabel arrived from Havana on the —— of July, went into her berth on the south side of Dry Dock Wharf (separated from the Vesta by the width of the wharf only), and re-

mained there until the 1st of August. Thus was the Vesta exposed, like the Sullivan, to two sources of infection.

On the 5th of August one of her crew was seized with yellow fever, and was sent into the Marine Hospital on the 7th; on the 9th another man was attacked.

Mr. Garvey, an Irishman, residing at No. 20 Pinckney Street, was employed in pumping out and disinfecting the barque Aquatic, during the greater part of which time he worked in the hold. While heated by work he was wet by rain and was attacked with yellow fever on the 11th of August, and died on the 15th. About the same time, another Irishman, Mr. McNeal, who worked with Garvey in the hold of the Aquatic, sickened with yellow fever, but recovered. These were the only men who were employed *in the hold of the vessel.* Of fifteen men employed on the deck, and who did not go into the hold, two died.

It is evident from this that the barque Aquatic was the second source of the introduction of the fever, and would have been capable, had it not been imported by the Columbus and Concha, of giving rise to its subsequent prevalence.

4. It has been stated that no terrene or aquatic difference existed in the docks in which lay the Columbus and Concha, and other docks; none, as admitted even by those members of the profession of the city who believe in the domestic origin of the fever.

5. It was not until three weeks after the outbreak of the disease at Central and Dry Dock Wharves, that cases occurred among the crews of vessels in other docks, even two or three removed from those centres.

6. Vessels arriving at the same time as the schooners Monterey, Susan Cannon, &c. (the histories of which are given above), but going into other docks, did not have their crews affected.

7. It is worthy of remark that the cases which presented the greatest malignancy and the greatest proportionate mortality were those which occurred on the vessels, the berths of which were the same as those of the Columbus and Concha; thus, the schooner Maine Law lost six men—her whole crew—three of whom were natives of the Azores, and who, in regard to comparative insusceptibility to the disease and liability to recovery, may be ranked with Spaniards, Portuguese, and Italians.

8. Other Spanish, and two American vessels, which arrived from ports in Cuba at or about the same time as the Columbus and Concha, and had had no cases of fever on board, either during the

passage or subsequently to their arrival, did not become centres for the spread of the disease.

Let us now trace its steps in the city with the object of showing the connection, immediate or remote, of the first few cases, with the shipping. The case of Mr. S——, above narrated, was, there can scarcely exist a doubt, contracted by his visits to the Concha. Mr. F——, clerk to Mr. Dulin, whose office is likewise on the wharf at which the Concha was moored, and who likewise visited that vessel, was attacked on the 17th of August, and died at his residence in King St. on the 27th.

An Irish woman, in the service of Mr. G. M., on East Bay Street, opposite to North Commercial Wharf (where the barque Aquatic lay, while in a foul state, during two days), was attacked on the 12th of August and died on the 16th with black vomit. In this case, a month intervened between the arrival of the Aquatic and the attack of the fever; but instances are on record in which the latent period has been prolonged beyond a month.

Mrs. Gorham, Irishwoman, residing in Calhoun, near Elizabeth Street, was attacked on the 15th of August, and died with black vomit on the 18th. This woman's husband worked, I am informed, on the deck of the Aquatic, so that although he did not take the disease himself, yet it is probable that it was communicated to his wife by the fomites of his clothes.

Two Germans residing at the foot of Hasell Street, not far from the berth of the Aquatic, were attacked on the 19th of August, and the cases soon multiplied indefinitely in the streets adjacent to the wharves.

It is thus apparent that the origin and behavior of the fever this year does not differ from that of former years as far as our information goes. It occurs first among the shipping, and then spreads slowly or rapidly, as the case may be.

Now when so many coincidences of the same nature occur, as have been above enumerated respecting the origin of the fever of 1854, supported, as they are, by coincidences of the same nature in former epidemics in this city, they cannot be considered as the result of chance or accident, but logically prove the relation of cause to effect, thereby establishing the *law* governing the origin of the fever, which may be thus stated: Given, the antecedent or *causa sine qua non*, a high degree of heat long continued, and the application of the specific poison, or *causa causans*, from without, and the effect, the fever, follows.

Of equal importance with, and nearly allied to, if not identical with the question just discussed—the importation or non-importation of the fever—is that of its communicable or non-communicable (contagious or non-contagious) nature; and the few remarks which will be made respecting it shall have reference only to what occurred that year.

In my opinion, this question is affirmatively answered by the instances already given of the extension of the disease to the crews of vessels lying contiguous to the Columbus and Concha, and to the two clerks in offices on the wharf at which lay the latter vessel. It is a matter of perfect indifference whether it was the poison contained in the Spanish vessels, or the cases of fever which occurred on one or both of them, which communicated the disease to the crews of the Sullivan and other vessels lying in the same or adjoining docks, and to the two clerks. It can be communicated in the one as well as the other way, since the two modes do not differ in principle. In the one case, it is equivalent to expanding or diffusing into the atmosphere of Charleston a portion of the yellow fever atmosphere of Havana, containing the *materies morbi:* in the other, the *materies morbi* is given off immediately and directly from the diseased body. It is enough to know that the poison *is diffused* through the air; into whom it may penetrate and reproduce itself is a matter of no moment. Who will pretend to limit the distance of the contagion of variola? Even malarial fever has been contracted by the crews of British vessels engaged in the suppression of the slave trade, 40 miles from the coast of Africa. But inasmuch as close approach to the sick is required by some in proof of the transmission of the fever, I shall mention the few instances of this character which I have been able to collect.

At the commencement of an epidemic of any disease, it may be easy to ascertain definitely the fact of the disease attacking persons who have had intercourse with the sick; but at a later period, when the poison shall have become diffused, intercourse with the sick, or subjection to the atmosphere of a house in which one or more persons are sick, becomes valueless as a test of its communicability. For this reason, no single epidemic is likely to furnish many instances of transmission.

I have already narrated the case of Mr. S——, clerk to Messrs. Hall & Co., whose place of residence was the Planter's Hotel, Church Street. The Irish woman who washed his clothes during his sickness took the disease before he had quite recovered. A very short

time after, a son of the hotel-keeper likewise took the fever, and it then spread over the premises. It must be borne in mind that the Irish woman took the disease at a time when it was still confined to the shipping, or those immediately connected with it, as was Mr. S——.

The daughter of Mrs. Gorham (whose case has been twice mentioned), a child two years of age, who slept with her mother during her sickness, was seized with the fever the day preceding the mother's death, and died herself, two days after her mother, with black vomit. Mrs. Gorham's case seemed to be the centre of radiation of the fever in that locality.

The following cases are reported on the authority of Dr. William Hume (*Charleston Medical Journal and Review*, Vol. X. No. 1).

"On the morning of the day on which Mrs. Gorham died, her friend Ann Corran (Irish), residing in Mill Street, Cannonborough, visited her, found her assistance necessary; remained, nursed her, and laid her out, and finally attended her funeral (this was on the 19th of August); she returned to Mill Street the next afternoon, was herself seized with the fever on the 25th, and was immediately removed to the Almshouse Hospital, where she died on the 3d of September." Cannonborough is in the northwestern part of the city, and no case of fever had occurred anywhere in that section at the date of Ann Corran's attack. The occurrence of other cases in the family was probably prevented by her being early taken away.

"An Irish woman, living opposite to the Marine Hospital, in Franklin Street, was in the habit of obtaining water from the cistern in the yard of the hospital; she never saw the yellow fever patients: she never entered beyond the basement; yet she was the first case in the street.

"An acclimated lady, residing in a then healthy portion of the city, determined to visit a sick friend. She inadvertently took her daughter with her; while there, she thought of her imprudence in taking the child, and immediately sent her home; this child was the first to develop the disease in her own home, and suffered the penalty of her mother's thoughtlessness. Other members of the family soon took the disease, which subsequently infected the neighborhood."

During the prevalence of the fever in the city, Mrs. Grove, the wife of the engineer of Potter's Mill, on the western bank of the Ashley River, sickened with the fever and died. A few days after her death, Mr. Grove went, with his son, about 8 or 10 years of

age, to Wilmington, N. C. Three or four days after his arrival in that city, the boy was seized with yellow fever, threw up black vomit freely, but recovered. His aunt, in whose house he was staying, who nursed him during his sickness, took the fever and died with black vomit. A few days after this lady's death, a lady in an adjoining house took a fever, of which she died. Relative to the nature of the last case, there was a difference of opinion among the physicians who attended her; the regular medical attendant being of the opinion that it was a bilious remittent, and the consulting physician, who had attended the boy and his aunt, pronouncing it of the same nature as theirs, viz., yellow fever. Subsequently to this, a man was attacked about one block distant, and died. These were all the cases which were observed in that city. The above facts were communicated to me by Dr. J. F. McRee, of Wilmington; and I can only regret that his letter has been mislaid.

Would not proof of the same *kind* and *degree* as this case furnishes, be admitted as sufficient to account for the introduction of variola, scarlatina, or rubeola, into a place? If so, how can its applicability to the communication of yellow fever be denied?

The disease did not visit like a census-taker; but when it once effected an entrance into a house, all the inmates, white and black, who were liable to it, took it in rapid succession; two, three, four, or more members, and in some instances the whole family were simultaneously sick. I have known the members of two families, consisting of eight and eleven persons respectively, down with it at one and the same time; a circumstance of common occurrence in the Dengue of 1850.

The consideration of the last topic leads me to adduce, in support of the contagiousness of the fever, as manifested in this epidemic, the calculation made by the celebrated mathematician, Bishop Brinkley, of Ireland, relative to that of any disease. This calculation, to which reference is had by Dr. Stokes, in his admirable lectures on Fever, recently published, shows that an overwhelming number of chances—189,000,000—exist against the occurrence of a certain event, such as the sickening of *eleven* out of *twelve*, of a family, in a particular district, if the sickening of one did not promote that of another, or in other words, if the disease were not contagious. Now, after making a deduction of 100,000,000 for the effects of local influences, which element, as Dr. Paget correctly observes, did not enter into Bishop Brinkley's calculation,

and which should be subtracted, there would still be left 89,000,000 of chances to 1—a result more than amply sufficient to confirm the doctrine of the communicability of the disease. But even if local causes were to reduce the probability to 1000 to 1, yet Dr. Paget admits that this latter probability would be sufficient to carry conviction to any candid person.

In the circle of my practice, there was a family consisting, white and black, of fourteen members; of this number thirteen had the fever in different degrees, four severely; but in all it was well marked. And it is probable that other practitioners saw, in some instances, an equally large proportion affected.