Remarks on the origin and mode of progression of yellow fever in Philadelphia based on the occurrence of the disease in that city and at the Lazaretto, in the months of July, August, and September, 1870 / by R. La Roche.

REMARKS

ON THE

ORIGIN AND MODE OF PROGRESSION OF YELLOW FEVER,

IN PHILADELPHIA,

BASED ON THE

OCCURRENCE OF THE DISEASE IN THAT CITY AND AT THE LAZARETTO, IN THE MONTHS OF JULY, AUGUST, AND SEPTEMBER, 1870.

BY

R. LA ROCHE, M.D.,

MEMBER OF THE BOARD OF HEALTH.

PHILADELPHIA:

1871.

ERRATA.

P. 21, 13th line from bottom, *omit* "by order of the Board."

P. 27, 5th line from bottom, *for* "those so engaged," *read* "those *not* so engaged."

P. 51, 9th line from top, *for* "except," *read* "only."

P. 56, 16th line from top, *for* "amounted to between two hundred and fifty and six hundred," *read* "amounted to from two hundred and fifty to six hundred."

P. 59, 17th line from top, *for* "whom," *read* "which."

P. 61, 13th line from top, *for* "this case," *read* "these cases."

P. 61, 15th line from top, *for* "it was," *read* "they were."

ORIGIN AND MODE

OF

PROGRESSION OF YELLOW FEVER,

IN PHILADELPHIA IN 1870.

Scarcely a year elapses without the occurrence of yellow fever in one or more of the quarantine stations of this country, carried thither in vessels from sickly ports of the West Indies, of the coast of South America, or of some of our Southern States. Individuals, while laboring under the disease, or who only sicken during their passage home or after they have reached their destination, from having imbibed the poison at the place of departure, are landed from such vessels and received in the hospital of the station, there to recover or die—the vessels themselves remaining, in the mean while, free from contamination and incapable of producing injurious effects on those who visit them. In other instances vessels do more than act simply as carriers of the fever in its advanced or incipient stages. They reach the station in an infected state, carrying with them not only, as they sometimes do, like the preceding vessels, patients laboring under the disease, but, in addition, the poison giving rise to the latter—a power obtained in different ways. Leaving a port situated within the yellow fever zone, and at which they have remained some time, discharging and taking in cargo, during the epidemic prevalence there of the disease, some, though clean and noted for an absence of infectious impurities, become, as well sometimes as a portion of their contents, sources of disease from being, as it were, saturated with the febrile poison floating in the atmosphere. Others become contaminated either while in port and under the circumstances described, or during the passage, by the decomposition, through the influential action of excessive heat and deficient ventilation, of the refuse materials accumulated in their holds and under their limber boards, of their bilge-water, and of the filth scattered about, and by the consequent

generation of the destructive agent which imparts to them the power of disseminating the disease wherever they proceed.

In thus alluding to the mode in which such vessels acquire this power, I say nothing of the idea advocated by some respectable authorities who maintain that such vessels become often infected by the poisonous effluvia emanating from the bodies, or the bedding, clothing, and other personal effects, of individuals who have gone through the disease on board, while in port or at sea, inasmuch as the admission of this explanation of the occurrence of infection carries along with it a belief in the doctrine of personal contagion, which, were it for no other reason than the fact of those individuals invariably failing, everywhere on land and under all possible circumstances, to produce the same morbific effects, we are admonished to reject; while as far as regards the bedding and clothing of the sick, a subject on which more will be said presently, I must withhold my willingness to attribute to them a main agency in the production of the effect in question till I possess better proofs than have yet come within my reach of their becoming sources of febrile infection on shipboard or on land.

But whatever be the mode in which the infection occurs, such vessels, though free from sickness at the time of arrival, but having not unfrequently lost while at sea one or more of their crew or passengers, are detained at quarantine, and there communicate the fever to those who go on board or who reside or move about near enough to feel the morbific influence of the tainted air issuing from their opened hatchways.

It not unfrequently happens, too, that vessels leaving southern ports where yellow fever does not prevail at the time, and, indeed, places where it has seldom if ever prevailed, and being in an apparently satisfactory condition, are provided with clean bills of health, arrive at quarantine stations in a decidedly infected state, the poison having been developed on board, independently of any exotic source of contamination, from the decomposition of the foul materials accumulated in their holds or other compartments, or from the decay of the timber of which they are constructed, under the injurious influence of a tropical heat. These vessels, in some instances, have lost during the passage one or more of their inmates with unmistakable symptoms of the disease. In merchant vessels more particularly, they arrive without having suffered in that way, probably owing to the complete seclusion of the crew from the hold, the principal focus of the infection. But whatever be their condition in that respect at the time of arrival, they sometimes communicate the infection, especially after the removal of the

hatches, to those who visit them or work on board, as well as to many who, though at a distance and having had no direct communication with them, breathe the morbific effluvia wafted ashore from the source of infection through the agency of the wind.

Instances of the first two modes of importability of the yellow fever to quarantine establishments, to say nothing of other places where vessels so conditioned have, from negligence or other causes, reached without detention at quarantine, have been so repeatedly and minutely recorded and are so universally admitted to occur, that it would be a waste of time—a perfect work of supererogation—to prove the reality of their occurrence and the results to which they give rise by a reference to more than a few of the many facts that might be collected for the purpose. A more extended examination of the subject as well as an inquiry into the nature of the febrile poison—whether the morbific fermentative agent and the destructive matter resulting from its operation, consists, like those of most other, if not all, zymotic diseases in living organized microscopic beings—whether, again, these beings are to be referred to the animal or the vegetable kingdoms—animalcular or fungoid—"produced out of pre-existing germs under peculiar and favorable circumstances of locality and atmosphere, and capable of propagating and multiplying to an indefinite extent whenever and wherever those circumstances are found to exist, and of giving rise, by their deleterious action on the system, to particular morbific effects;" all this, I say, would occupy more room than can be spared on the present occasion, and be, besides, somewhat irrelevant to the object I have in view.

In regard to the third category, of vessels through the agency of which the yellow fever is imported into quarantine stations—those which leaving a port where the disease does not at the time prevail or has never prevailed, and, nevertheless, becoming infected during the course of the voyage within the yellow fever zone, carry the disease to the place of arrival—it may not be improper to mention that the reality of such occurrences which, on former occasions, I have endeavored, by an array of facts, to establish, has been doubted or positively denied by authorities entitled to our respect, who maintain that the facts upon which the opinion in question rests have been imperfectly observed; that in all instances supposed to be of that kind, the poison has in truth been introduced into the ship while it lay in an infected port, either by persons laboring under the fever, or by their effects, or by its inclosure in the hold, or in some other way. Such is the view entertained relative to this subject by an intelligent but dogmatical and pretentious

writer, M. Dutroulau, whose experience in yellow fever was obtained in the West Indies. This gentleman thinks himself authorized to lay down the law on this, as, indeed, on many other points connected with the fever, and does not hesitate to make the following remarks: "The question of the spontaneous generation of yellow fever on shipboard had been forgotten for thirty years, and nothing in facts —at least so far as my researches enable me to decide—could authorize Dr. La Roche (of Philadelphia), who revived the question in 1853, in reproducing the statement of events incapable of proving the reality of the development in question (*faits peu probants*) and imperfectly observed, upon which the opinion rested at the commencement of the present century."

Another writer, Mr. Rufz, who, like M. Dutroulau, derived his knowledge of yellow fever in the West Indies, is of opinion that however long a vessel may remain at sea in the latitudes of India, China, etc., it never becomes the seat of the yellow fever infection. This disease manifests itself only in ships which have remained more or less time in ports subject to visitations of the disease, or where it prevailed at the time of their departure. The fever is never developed spontaneously from the pure and simple infection of the hold. A prior focus of infection from which the germ or efficient cause of the disease is derived is required. In a word, the hold of a ship is only a receptacle, and not the seat, of the spontaneous development of the efficient cause.

To this view of the subject the impartial inquirer, who has made himself better acquainted with recorded and well authenticated facts relative to this subject than MM. Dutroulau and Rufz appear to have done, must feel disposed to demur. Aware, as he must be, and as I have long since shown and will again point out before the present communication is closed, that the yellow fever is spontaneously developed on land in southern and middle latitudes within the yellow fever zone during the prevalence of high atmospheric heat, he will scarcely feel disposed to deny the possibility of a like occurrence in high latitudes, especially under like meteorological and thermometrical conditions within that zone, on board of ships containing the materials requisite for the evolution, by their decomposition, of the febrific poison. I say within that zone, for it cannot be expected that the disease could break out on shipboard in parts of the world situated beyond it, where the true yellow fever never shows itself on land, and where, therefore, the materials from which the poison in question—be its nature what it may—is evolved, do not exist. Add to this that while, for the sake of argument, he might admit (which I am far from doing) that some of the facts

adduced by me and others in illustration of such a spontaneous development may be amenable to the charge brought against them by Dr. Dutroulau, many others of ancient and recent date are too well authenticated to be laid aside as unworthy of serious consideration, recorded, as they are, by professional writers of undoubted accuracy of observation, and entitled, as far as I am able to decide, to as much confidence as that gentleman himself, or any other writers who entertain the same sentiments.

The personal interest I naturally feel in the solution of the question must be my apology for dwelling somewhat on the subject and adducing several facts in support of the opinion I have expressed.

I can see no reason for rejecting the testimony of Dr. Meyer, of the Island of St. Thomas, who in a document furnished by him to Dr. Chervin, states his having seen vessels arriving from Hamburg, on board of which the yellow fever had broken out before they had reached the West Indies. Dr. Rolland, a resident of Santiago de Cuba, but who formerly was hospital physician in St. Domingo, in a communication addressed to Dr. Chervin, says that "when vessels coming from Europe enter the tropics, and experience long calms, it is not uncommon to find some of the men attacked with all the symptoms of the fever—hemorrhage, black vomit, jaundice, etc.—and dying on board; while others who are seized nearer shore with fever, characterized with the same symptoms, are carried to the hospital, and there go through the disease." Dr. Leger, who, like the former physician, practised in St. Domingo, informs us that the yellow fever is occasionally developed on board of vessels that experience long calms in hot latitudes during the passage from Europe to America. In 1803, says Dr. L., the sloop-of-war *La Nourrice*, on her way from France to St. Domingo, furnished us with a remarkable instance of the production of yellow fever at sea on shipboard.

According to Dr. Don Antonio Pineda, of Santo Domingo, an English vessel coming directly from London, and which had communicated with no other vessel during the passage, was found on reaching the mouth of the *Ozama* to have several cases of yellow fever on board. Dr. Don Juan Angel Perez, surgeon in the Spanish navy, stationed at the Havana, affirms in a like document having seen vessels of all nations, though especially Dutch and French, on board of which yellow fever had broken out before their reaching land.

A further and more decisive example of the spontaneous development of yellow fever on shipboard will be found in the his-

tory of some vessels forming part of a French flotilla filled with troops, in 1802. These vessels sailed from Tarentum for the island of St. Domingo. The flotilla consisted of small Neapolitan polaccas, under the escort of a frigate, each of which, though only intended for the accommodation of at most one hundred men, received one hundred and fifty. Encountering, soon after leaving the port, a severe storm, the vessels were dispersed, and sought shelter where best they could. They reassembled at Leghorn, and thence proceeded to Cadiz, there to join another division of troops that were to form part of the expedition. Stopping again at Carthagena to take in provisions and to refit, the vessels set sail for St. Domingo, the troops being now transferred to eight other vessels freighted for that purpose. Of these vessels one was set apart for the accommodation of the sick.

The spring had been cold and wet. Summer came on suddenly, and was characterized during the months of June, July, and August by intense heat. Soon after the departure of the vessels from Carthagena fever broke out on board, and continued to prevail in some of the ships till their arrival at Cape Haytien, spreading more extensively and acquiring greater malignancy as they approached the tropics and were exposed to a higher temperature. The disease, without doubt, consisted of one of the several forms of true yellow fever. At the time of arrival, this disease in all its purity was prevailing among the troops at St. Domingo, and by comparing the symptoms presented by the cases on board with those noticed on shore, the surgeon of the squadron was enabled to convince himself of the identity of the two diseases. In this instance there cannot be the remotest reason for referring the disease to any other than a local cause developed on board of the affected ships. Nothing is said of the soldiers having imbibed the poison at Leghorn, Cadiz, or Carthagena; and, indeed, such an event could not have occurred, inasmuch as in neither of those places did it exist that year. Dr. Béguerie, the chronicler of the event, lays some stress on the effects of bad nourishment; but more particularly on the excessive heat to which the men were exposed, as also on vicissitudes of temperature and exposure to night air; but he likewise attaches much importance to the morbid exhalations arising from the accumulation of the troops, and the decomposition of animal and vegetable substances contained in the vessels. The disease manifested no contagious property.

The history of the visitation of the fever on board of the U. S. frigate General Green, though doubtless unknown to Drs. Dutroulau and Rufz, must be familiar to many American readers. The ship

left Newport (R. I.) on the 3d of June, and reached the Havana on the 4th of July. The disease commenced during the passage, and extended rapidly. The crew thus affected had had, to use the language of Dr. Kollock, to whom we are indebted for an account of the occurrence, no communication with any vessel at sea, nor had they touched at any place in their passage, or even had intercourse with the town or vessels in the harbor till after the breaking out of the disease. Other vessels in port were no more than usually sickly, and the inhabitants of the island were remarkably healthy. "The principle of the disease," continues that writer, "seemed to have been generated on board, and to have gradually acquired virulence and activity as they approached the place of their destination. Those who frequented the hold, and were stationed in the neighborhood of the pumps, suffered more especially during the continuance of the disease, as they had been the first attacked by it." The disease was identified as yellow fever by Dr. Halliday, an experienced practitioner of the Havana, and author of a clever essay on the disease as it appeared there in 1794.

In the following year the fever once more broke out in the ship after a long cruise in warm climates, where, however, she had not been exposed to morbid effluvia from the shore or contaminated ships, and where the crew had remained all the time universally healthy. The frigate reached the Chesapeake on the 11th of July. Thence, after a detention of three days, she sailed for Newport, where she arrived on the 21st. Every customary method of preserving purity of air and the health of the seamen had been assiduously observed. Nevertheless, the yellow fever broke out in her soon after she had left the mouth of the Bay, and continued to prevail after her arrival at Newport, when it assumed a more malignant and fatal character, and attacked some individuals from the town who worked on board or bathed near her at the time her bilge-water was pumped out.

I will not do more than briefly call attention to the French ship-of-the-line Souverain, mentioned by Dalmas, in which the yellow fever broke out and prevailed extensively during the passage from Europe to the West Indies, attacking more readily and fatally those who slept on the lower deck. "Those who slept on the gun-deck were less severely treated, while those employed in the rigging, as also the officers, escaped almost to a man." These facts, when taken in connection with the circumstance that the disease commenced at sea, and without the vessel having communicated with contaminated ships in port, show plainly that the cause of infection was located, and had originated, in the hold. Let me add that the

narrator of the event was as well acquainted with the yellow fever and as capable of observing correctly every circumstance connected with the disease as Dr. Dutroulau himself. Much to the same effect and as entitled to our respect is the case of the brig Fabricius, of Marseilles, in which the yellow fever broke out at sea before it had reached Fort Royal, during the sickly season of 1818. At the time of her arrival there the ship had several sick on board. The distance at which this vessel was from the coast at the time of the outbreak of the disease, forbids the idea suggested by Keraudren that the infection was due to the wafting of the effluvia from the shore. Again, we read of the Columbia, which arrived at Marseilles from Rhode Island in 1802, with the yellow fever on board, and of the Nicolino, which suffered at that place in 1821 from the same cause. In neither of these vessels could the disease have arisen from any but local causes. As regards the former especially, the idea of a foreign source is inadmissible; for the Columbia had sailed from Rhode Island, where, as we know well, the disease did not prevail at the time of her departure.

In the same connection the case of the U. S. steamer Water Witch may be cited. This vessel arrived at the Philadelphia lazaretto on the last day of September, 1860, from a cruise on the south side of the Island of Cuba. During the passage the Water Witch lost two men with decided and unmistakable symptoms of yellow fever, and, on reaching the quarantine station, landed five cases, four with a mild but well-marked form of the disease, while the other, who at his admission in the hospital had reached the fifth day of the attack, exhibited a combination of symptoms of a most formidable character. The Water Witch had lain for some time at anchor at the distance of about a mile from the port of Cienfuegos. While there, boats were sent to the town morning and evening each day—in the morning for provisions, and in the evening to convey the officers. No yellow fever prevailed at that place or among the shipping, which, unlike the Water Witch, were anchored at the wharves, and consequently close to the town. No sickness occurred on board of the latter vessel, except a few cases of ephemeral fevers (calenturas) presenting none of the characteristic symptoms of, and in no way to be confounded with, yellow fever.

The vessel next went to the Isle of Pines, the healthiest spot in all Cuba, where, so far as I can learn, yellow fever seldom if ever originates, and where certainly it did not prevail at that time. There, however, the disease broke out in the vessel, and, after the occurrence of several cases, the captain determined to bring his vessel to the United States, in order thereby to arrest the further

progress of the infection. Now, it was matter of observation that, with one solitary exception, none of the men attacked, whether at the Isle of Pines or on the passage home, had been ashore at Cienfuegos, or had manned the boats that plied from the vessel to that place mornings and evenings. Even had the disease prevailed in the town or among the shipping—which, as stated, was not the case—those that sickened could not have contracted it there. The subject of the exceptional case was not the first to suffer, and had so mild an attack as to leave a strong doubt as to the disease being the true yellow fever. I may mention that it is equally certain, that though the first cases occurred at the Isle of Pines, they could not, for the reason stated, have originated from a poison derived from that place. The conclusion most natural, taking all those circumstances into consideration, is that the poison originated on board. One thing is certain, that all the cases were traced to the same part of the vessel—the fore division of the deck, in the vicinity of the galley. This part is small—much too small for the number of men confined in it, considering especially the climate of the region where the vessel was cruising, and the additional heat issuing from the galley. It is, besides, low, imperfectly ventilated, and near the pumps and hatches, from which issued a highly offensive smell proceeding from the hold.

Cases like those here referred to are, unless I greatly err, too well authenticated and recorded by physicians of too much experience and of too high a professional standing to be ignored as unworthy of notice, and stigmatized as having been imperfectly observed, and as being, in consequence, destitute of the value requisite to justify their being used to illustrate the spontaneous development of the efficient cause of yellow fever on shipboard. They certainly afford no ground for the aspersion so indiscriminately cast upon them, and the charge of incompetency indirectly made against their narrators by Dr. Dutroulau, and can in no way justify the magisterial tone he assumes in reprimanding me for having recalled the attention of the profession to the subject, after it had, as he says, lain dormant and forgotten since the commencement of the present century.

Other cases of similar import recorded, for various purposes, by authorities of too high a character to be set aside contemptuously, may be adduced. Among them the following are particularly worthy of notice. The British steamer Eclair, after suffering severely in 1844 from bilious remittent fever on the coast of Africa—off Sherbro and Seabar—where yellow fever, if it has ever prevailed, did not do so at the time—arrived in July of that year

at Sierra Leone, which likewise was free from the fever, and had been so for several years past. Notwithstanding the absence of the disease from both these points, the Eclair suffered from it at sea a short time after leaving the latter, and was the agent of its transmission to Boa Vista and subsequently to England. I shall not enter into any detail respecting the history of the vessel, but limit myself, as I have already done in another place, with the remark that it is obvious, whatever Dr. Dutroulau may say to the contrary, that the absence of an epidemic of yellow fever at Sierra Leone, forbids the supposition of the vessel having carried thence a tainted atmosphere capable of affecting the crew during the rest of her melancholic history; or of the individuals composing the crew having imbibed a quantity of poisonous germs which, after remaining dormant in their systems, broke out at successive times up to their reaching England. And yet from the day the Eclair left that port (S. L.)—on the 24th of July—to the 9th of August, fifteen cases occurred on board; and from the 19th of July, when the first case of fever presented itself, to the 31st of August, when the crew were landed at Boa Vista, forty-four cases and sixteen deaths were reported. These cases must have been derived from causes existing on board; for no idea was entertained, up to that period at least, that the disease was propagated by contagion, and it is admitted by Dr. M. E. Williams himself, the narrator of the event and a warm partisan of the doctrine of contagion, that it did not manifest such a property prior to the arrival of the vessel at Boa Vista. If so, the disease could not have been communicated on board in that way, and transmitted from one individual to another. Even admitting that the crew and officers could have imbibed the poison at Sierra Leone, the disease by which some of them were attacked during the close of the passage, and especially on their arrival at Boa Vista (some forty days), could not have been the result of such an exposure, inasmuch as the time which elapsed between that exposure and the moment of the attack was too long to enable us to explain the occurrence on the principle of incubation.

Omitting other cases to which no objection could be made, I shall content myself with referring to one of a recent date which occurred in this country, and for an account of which the profession is indebted to Dr. Elisha Harris, of New York. This distinguished physician, who, let it be remarked, entertains decided views concerning the transportability and the infectious nature of yellow fever, through means of fomites, in submitting to the Academy of Medicine of New York notes collected by him in July, 1865,

upon the public health of New Orleans during the war, remarked that perhaps there had never been a more enlightened and faithful exercise of regulations in the nature of quarantine than was witnessed in that city during the preceding years. "Yellow fever and smallpox were the only infections feared or guarded against. All the exotic and transportable causes or *fomites* of these maladies were detained at the quarantine anchorage, sixty-five miles down the river, near Fort Philip." The first of these diseases (yellow fever) "did not become epidemic in the city. Nearly three and a half years passed without so many as a score of sporadic cases occurring in the streets where that enemy and pest of the city had been wont to destroy its thousand victims every year, and sometimes to kill no less than *five thousand* in a single *month!*" "With the peculiar and abundant experience of yellow fever in the ports of the north fresh in mind, the history of this malady at New Orleans and in our naval fleet on the Mississippi was investigated with all the predilection which such experience could justly impart in favor of the theory of the exotic and imported origin of the disease."

"Well-marked and fatal cases of yellow fever occurred in New Orleans in the autumn of 1863 and in the autumn of 1864. In the former year the Charity Hospital received two cases, both of which proved fatal. Both were boat hands from the steamer J. H. Hancock, a river tug. In 1864, there were five undoubted and fatal cases of yellow fever, terminating in black vomit. They all occurred in persons who resided or daily visited in the vicinity of Erato, Tchapitoulas, and New Levée Streets. They were exposed to known causes of the fever." Dr. Harris, in continuation, remarks, "We have referred to the two cases from a tug in the river, in the autumn of 1863. Nearly one hundred other cases of the fever occurred in the river fleet and in the Naval Hospital that season. The history of all these cases in detail shows that they were not of imported origin. They nearly all occurred in crowded, filthy, and non-ventilated gunboats that were at anchor in the river at New Orleans. As regards the occurrences of the following year, 1864, we are told that "the fever occurred principally in twenty-five gunboats lying near New Orleans; that some of them had been stationed there several years. The fact then is indisputable that yellow fever visited twenty-five vessels in the fleet that was anchored in the river in front of New Orleans during the summer of 1864, and the disease appeared first (as early as September 12), in vessels that had been for a long time at anchor there." "Filthiness, crowding, excessive heat and moisture, lack of ventilation, and the stag-

nation incident to anchorage in a tideless stream, constitute the leading facts relating to the infected vessels." To test the merit of this view of the *spontaneous* origin of the fever, Dr. Harris obtained the written history of every case of which any note was made at the Naval Hospital and elsewhere. He also obtained from the quartermaster, in charge of water transportation, a record of the one hundred and twenty steamers and sailing vessels that were under his control. Of these *active* vessels only one had yellow fever on board. These ordinary mercantile and transport vessels were open and ventilated, and though moving about from place to place, and thereby infinitely more exposed to all sources of exotic infection, escaped with one solitary exception; the gunboats which were exempt from such exposure, and which had no chance of infection from any source except by the development of the disease on board, suffered considerably. The number of cases in these vessels amounted to one hundred and ninety-one, with a mortality of fifty-seven. In addition to these there were twelve cases and three deaths among employees and guards at the Erato Street landing and the Naval Hospital, situated on New Levee Street, with yards and accessory buildings towards Erato and Tchapitoulas Streets. Five other cases of black vomit occurred in citizens exposed to the same causes, in the vicinity of the landing.

From all that precedes, Dr. Harris draws the following conclusions: 1. The insalubrious circumstances that produce a constantly high death rate, and the localizing causes of diseases generally are the most important and the most preventable causes of the epidemics that affect cities. 2. The climate and topographical disadvantages which have hitherto been popularly supposed to be the essential causes of the insalubrity of New Orleans, are but unimportant factors of insalubrity which sink into insignificance when the preventable causes of disease in the city are controlled. 3. Yellow fever—the most dreaded scourge of New Orleans—was unequivocally generated in a large number of filthy and unventilated gunboats and other naval vessels lying idle at anchor within a mile from the densest portion of the city. 4. By fomites, or some other material agencies, the infection of yellow fever was communicated to the guard and to certain other persons who were exposed in a narrow district at the Naval Hospital landing in Erato Street, and near New Levée and Tchapitoulas Streets. 5. The infected vessels were remarkably close in their exterior construction; they discharged no cargoes; were under an armed surveillance and discipline; and were seemingly incapable, from these circumstances, of diffusing their own infection, except by the

clothing and "dunnage" of the sick when taken ashore. 6. Vessels and river boats of ordinary construction, and in active service, escaped yellow fever almost without exception. 7. Finally, no vessel infected with yellow fever, arriving by way of the Gulf of Mexico, was allowed to pass above the quarantine station, sixty-five miles from the city.*

In the foregoing instance, Drs. Dutroulau and Rufz, should they ever cast their eyes on these pages, will find one in which the spontaneous evolvement of the efficient cause of the yellow fever on shipboard is placed beyond the possibility of doubt. This cause could have been introduced in the anchored vessels neither from infected places up the river, nor, as must appear evident from what proceeds, from below, inasmuch as the disease did not prevail at the time anywhere along the river north of New Orleans; and besides, had it so prevailed, the strict military surveillance established in the fleet would have put an effectual bar to its introduction among the crews or other inmates of the several vessels; while the strict quarantine measures in force below the city shut out so effectually all sources of febrile effluvia from abroad, that all but one of the one hundred and twenty actively employed vessels under government control, plying up and down the river, and which would

* Bulletin of the New York Academy of Medicine, 1865, pp. 463–479. See also "Yellow Fever on the Atlantic Coast and at the South during the War," by Dr. Harris, in Memoirs of United States Sanitary Commission, pp. 236, &c.

In reference to this important event, Dr. Woodward, in his "Report on Epidemic Cholera and Yellow Fever in the United States Army during 1867," makes the following remarks: "During the summer and fall of 1864, a number of cases occurred, also, on the naval vessels lying before New Orleans. As usual, the disease has been said by some to have originated on the spot, and the bad hygienic condition of certain of the iron-clads has been indicated as furnishing the necessary conditions. But the Spanish ship Pizarro, with yellow fever on board, had been sent to the quarantine station July 4th, and it is believed that, if a full account of all the facts of the case could be obtained, it would be found that the naval epidemic of 1864 would prove no exception to the general rule."—(Circular No. 1, War Department, Surgeon-General's Office, p. xxxvii.)

In answer to this, it may be remarked that the Pizarro does not appear to have come up to the city; but to have been *detained* at the quarantine station, and that, too, in 1863, and not in 1864. So I infer from the statement of Dr. Baldwin, the medical officer at the station, to Dr. Harris: "On July 4th, 1863, the Spanish man of-war Pizarro, from Havana, was ordered into quarantine while on the way up the river. There were fifteen cases of yellow fever on board." The Pizarro could, therefore, have had no agency in introducing the fever into New Orleans in 1864, supposing it could have done so under any circumstances.

have been exposed to the exotic infection, had one existed at any point along the river, escaped the morbific influence. Nor could the disease have been communicated from the city to the suffering ships, inasmuch as it did not then prevail there, and had not done so, as we have seen, except sporadically, and on a very limited scale, for several years past. Taking all these circumstances into consideration, and discarding all idea that the facts here narrated were imperfectly observed, we cannot err in joining in the statement expressed by Dr. Harris, that the disease was unequivocally generated in the aforesaid filthy and ill-ventilated gunboats and other naval vessels lying idly at anchor within a mile from the city. Whether, as likewise suggested by Dr. H., the infection of the fever was communicated to the guard and to certain other persons exposed in a narrow district at the naval hospital landing and New Levée and Tchapitoulas Streets by fomites or some other material agency, is a question in regard to which some difference of opinion may exist, and upon which I shall recur presently.

The case of the Messager, related by Rochou, in which the disease was evidently produced by a cargo of Mangrove trees, is in point. Here there was no other cause to account for the morbific effect, unless we refer it to the vessel itself. Dr. Chervin's documents contain several other examples of the generation of the yellow fever at sea, before the infected vessels had reached West India ports. In the case of the Regalia transport, which suffered considerably from the yellow fever, Dr. Ferguson ascribes the disease to the foulness of the ballast (small stones, with a considerable mixture of mud and other impurities), and to the operation of sea-water, resulting from leakage, on that ballast, as also to a quantity of green wood with which the vessel was loaded. His words are explicit: "The cause of the disease was, therefore, I am clearly of opinion, to be ascribed to the green wood laid in at Sierra Leone, operating, along with the foul ballast, to furnish, when impregnated with the gases arising from putrid sea-water, morbific miasmata, similar to those that on land arise from marshes, when exposed to the influence of the higher degrees of atmospheric heat." That the cause of the fever truly resided in the hold of the ship, is shown by the fact that the cleaning of that part was particularly injurious to those exposed; and that while the fumigation of the ship proved of no avail in purifying it, the disease ceased when she was completely cleaned, and with her hatchways closed, her hold had been exposed to the concentrated heat of many stoves. Let it be added, that though the Regalia communicated freely with the seaports of Barbadoes and other islands, landing the sick or dying subjects of that

disease among the inhabitants, or at the hospitals, the infection was not communicated anywhere; and that after being purified, she sailed from Guadeloupe for Europe crowded with prisoners, having on board a case of yellow fever which terminated fatally, without communicating the disease to those around.*

Be all this, however, as it may, the facts presented in the preceding pages, the number of which might easily have been increased, are, I feel confident, of a nature well calculated to overcome effectually all the objections raised against the reality of the generation of the yellow fever poison on shipboard. In some the fever broke out in ports situated in temperate regions under circumstances incompatible with the idea of importation, and even in vessels coming from parts of Europe where yellow fever has never existed. In others the fever made its appearance at sea before the vessels had reached tropical latitudes, or in vessels proceeding from one port situated in temperate regions to another similarly located, and in not a few the connection between the appearance of the fever, and the existence of materials which elsewhere give rise when in a state of decomposition to febrile effluvia, is too apparent to be doubted. Some of the facts adduced, as well as others of easy access, equally disprove the assertion that the development contended for takes place only, or principally, in vessels containing individuals who have recently visited sickly ports or have there been affected with the fever, or that it occurs only in vessels lying within the influence of infected ports in tropical regions, and is to be

* I might, were it necessary, appeal in support of the views here entertained respecting the spontaneous occurrence of yellow fever on board of ships, to the statements of high professional authorities, who, from opinions they advocate relative to the exotic origin and mode of transmission everywhere of the disease, could scarcely have been supposed to coincide in those views. Dr. Chisholm, for example, whose attachment to the doctrine of contagion and importation is proverbial, and who, maintaining that the fever which broke out in the Island of Grenada was derived from Bulam, would not allow it to have been developed either in that island or in any other place where it subsequently appeared, admits in his letter to Dr. Haygarth (pp. 217, 218), that it sprang up in the Hankey—not from a morbific virus derived from the Africans of Bulam, but from the foul condition of the vessel itself—which foulness, owing to some peculiarity in the African atmosphere, gave rise to a new pestilence which was introduced among the inhabitants of Grenada, and from thence spread by contagion to various other ports. In his account also of the fever of Demerara, in 1800, the same author traces the origin of the disease to a ship which arrived there from *Liverpool*, after touching at Surinam, and the filth of which, "occasioned by a cargo of horses, and the extreme neglect of the officers and crew, was such as beggars description."—(Letter to Dr. Davidson in Medical Repository, v. p. 229.)

referred to such influences; for in some instances the effect took place in vessels that had sailed from or were lying in ports where the fever, if it ever prevailed there, did not do so at the time, or had not for some or even many years before, and which, therefore, were not likely to contain individuals who had passed through the disease, recently or some time before, or who could in any contingency have derived the latter from morbific effluvia emanating from surrounding objects. Not less opposed to the assertions in question are several instances in which the fever appeared at sea, and far from any contaminated spot, as well as those in which while vessels were severely visited by the fever, others situated close by, in port or at sea, or on the same cruising ground, remained uninjured. In the first of this category of cases the cause of infection could not have been derived from surrounding objects, and must have been located in some parts of the vessels themselves; in the other, the complete escape of some ships exposed to the same influences from the shore, and the restriction of the disease to one close by, is, to say the least, a strong presumptive evidence of the poison being an intrinsic product of the latter itself or its contents, and not of morbific germs derived from an extrinsic source at the place where it was lying or whence it had just sailed.

As a further proof of the local origin of the yellow fever on shipboard from sources of miasmal infection, may be cited the example of those vessels in which the spread of the disease has been arrested, even in tropical climates or during the hot season of temperate regions, by a resort to a thorough process of expurgation. Add to this, too, that whether the infection proceed from the effluvia issuing from the bilge-water, the timber of the ship, the filth of the hold, or the cargo, the existence of the cause within the precincts of the ship, and its origin there, particularly in the hold, is rendered evident not only by the circumstances already mentioned, but by the limited space and the particular spots to which it is confined at the outset or throughout the whole duration of the epidemic. The disease, as might be expected, usually, or very frequently, makes its appearance, and is more severe in the vicinity of the pumps and main hatchway; for there the keel is more dependent, the water draining from other parts is accumulated, and the heat is most intense. In almost all cases the disease prevails more, and the risk of infection is greater on the lower than on the upper deck. It is sometimes confined to one end or one side of the vessel.

But I have dwelt long enough—I fear too long—on this subject, and must return to the legitimate object of these pages. The reader need hardly be told that what has been and continues to be,

noticed at all quarantine stations in relation to yellow fever, is of no uncommon occurrence at the one established near this city. Let it be remarked before proceeding further, and for a clearer illustration of what is to follow, that the quarantine station or lazaretto in question is located about ten miles below the city, and on the same side of the river Delaware. It occupies a tract of ten acres, with a river front of nine hundred and twenty-six feet. It faces south. At the distance of two hundred and seventy-three feet from the margin of the river and about midway between the western and eastern boundaries of the lot, stands an extensive building comprising the stewards' apartments, offices, etc., and the hospital, the whole consisting of a centre portion fifty feet square and three stories high, and of two wings sixty-four feet three inches long each. About half way between this building and the river as well also as about an equal distance from the centre avenue leading from the river to the hospital, to the western and eastern boundaries of the establishment, are placed, on the former side, the lazaretto physician's house, and on the other side the quarantine master's. On the west of the station, and separated from it by a narrow public lane extending from the interior of the country to the river, is located the government storehouse, a somewhat low building one hundred and twenty feet long, and in front of which is situated the government wharf, measuring from its river extremity to the storehouse two hundred and sixty feet. At the distance of one hundred and six feet from the western end, and a little to the rear of the last-named building, stands a large private house owned and occupied by Mr. Jacob Pepper. Besides the buildings just mentioned, others of more or less interest in relation to the subject under present consideration, are situated, both within the lazaretto inclosure and in its immediate vicinity. Of the former and north of the hospital may be mentioned the stables, kitchens, and a long two story building used as a smallpox and typhus hospital, and along the margin of the river front, several cottages for the accommodation of the bargemen; while in the rear of the government storehouse, and of course outside of the station, are placed several large three-story houses, one of which is occupied by the custom-house inspector.

At this station, no less than in other establishments of the kind, as its sanitary records show, individuals laboring under the fever under consideration almost every year arrive in vessels from West Indian or other ports where the fever prevails, and are landed and received in the hospital, where they go through the disease. Nor do those records fail to show that persons landed from such vessels

are attacked after reaching the station; and again, that other individuals who visit those vessels in their official capacity or for other purposes, or assist in the discharge of the cargoes; or others again who, without leaving the shore, are placed at no great distance from them, either within the lazaretto grounds or in the immediate vicinity, become similarly affected in a more or less severe manner.

Of such visitations, few have been more extensive and fatal than the one that occurred in July, August, and September of the present year, during the prevalence of the extensively hot weather, and the long continuance of S. W. and S. E. winds, by which the past summer was characterized. It may, indeed, be doubted whether any has been more entitled to the attention of the medical inquirer, as well from the number of the cases that occurred as from the malignant character of the disease, the great mortality, proportionally to the persons attacked, to which it gave rise, to the official position and social condition of some of the sufferers, and to the total absence of direct exposure on the part of many, if not the majority, of the sufferers, to the source of infection—*i.e.*, the interior of the ship—and the great distance to which the poison was, in some cases, undoubtedly carried.

This vessel, the brig Home, belonging to New York, arrived without a bill of health at the quarantine station on the 29th of June, from Jamaica with a cargo consisting almost exclusively of logwood. She anchored in the middle channel opposite the hospital and the station, and there remained ten days before being brought to the permanent wharf (situated as seen just below and almost adjoining the boundary line of the station and in front of the custom house stores) to be discharged. It would appear that at the time of her leaving the said mentioned island and while there taking in cargo, the yellow fever, notwithstanding the denial of the mate, prevailed in some of its ports, if not all, to a considerable extent. The lazaretto physician, the late Dr. Thompson, in reporting her arrival and condition to the Board of Health, under date of 29th of June, says: "The brig Home lost her captain at sea on the 24th or 25th instant, with fever, after some eight or nine days' sickness. The cook has evidently had the same disease about the same time, but is now about recovered." Of the yellow fever nature of the disease, with which they were both affected, there can be no doubt; but at the time mentioned, the fact was only strongly suspected—strongly enough, and on sufficient ground, to justify the action of the lazaretto physician in opposition to the sworn statement of the mate and crew, who, though aware of the true nature of the disease, combined in misrepresenting the fact upon which they were called upon

to testify, as well, indeed, as the condition of health of Jamaica, and maintaining that the captain had died of heart disease—a course subsequently found to have been pursued at the instigation of the mate, with a view to escape, if possible, detention at quarantine.

Notwithstanding the events recorded as having occurred during the passage, all on board were in health at the time of arrival. The vessel, however, was found by Dr. Thompson, and by all who worked on board, or had occasion to visit her while she lay at quarantine, to be in a very filthy condition; and there is good reason to believe that this condition was not of recent origin. It existed long before the vessel left the West Indies, as may be inferred from the statement of one of the sailors, who, after mentioning that at Kingston the hold was filled with logwood, states that this portion of the ship was in a filthy condition;—filled with dirty, black water, emitting odors which the crew could hardly endure while loading, and that planks were laid over this pool to keep the logwood dry. On this subject the port physician, Dr. Goodman, remarks: "The infected vessel was old, rotten, and saturated with filth." "Dr. Thompson declared that language was inadequate to describe the condition." Another who has been on quarantine duty for thirty years, and acted for thirty more as a sailor, stated that she was the filthiest vessel he ever saw. In a word, the Home was in a most efficient condition for the production of the yellow fever poison, or for aggravating the malignity of that morbific agent if received on board at an infected port.

On June 30th, Dr. Thompson writes to the Board: "The condition of the brig Home is such that it cannot be sufficiently improved short of the discharging the cargo." In consequence of what precedes, and in accordance with the recommendation of the doctor, the vessel, by order of the Board, was ordered to be quarantined, to be cleaned, fumigated, and disinfected, and to be discharged, which the owners were notified to have done at the station, and not, as they had suggested, on the island in the Delaware abreast of the city. To effect this object the owners or consignees were permitted by a resolution of the Board, to send lighters and stevedores to the lazaretto, and enjoined at the same time to furnish the names of the crews of those lighters and of the stevedores—the latter to remain at the station until the vessel was discharged. In conformity with this permission, three lighters, the barge James Kirkpatrick, Captain Doggett, the barge James Madison, Captain Cavister, and a third whose name, as well as that of the captain, is unknown, conveying a gang of stevedores, were sent down,

and on their arrival the process of discharge was immediately commenced. While this was being done, a passenger who had arrived in the vessel was, in accordance with the common practice of the health officer, permitted to come up to the city after submitting to the precautionary measures prescribed on such occasions. As regards the crew, the Board of Health resolved, on the 2d of July, that they be permitted to leave the station with the consent of the lazaretto physician, if in his opinion they were in a condition to be discharged. To this Dr. Thompson demurred, on the ground that it was advisable to keep them together for some days after their arrival, which was done until the 7th. It is well to state that the second mate—George Griffiths—absconded from the station on or about the 30th June.

On the 13th July, the Board "resolved that the stevedores, and the crews of the lighters engaged in the discharge of the brig Home, be permitted to come up to the city, if in the opinion of the lazaretto physician it can be done in safety to the inhabitants." In answer to this the lazaretto physician wrote under the same date: "From the developments thus far in reference to the brig Home, I am convinced of the impropriety of permitting those engaged in the discharge of her cargo intercourse with the city, and have therefore directed that they remain in quarantine for the present, or until it may be deemed safe to remove such restrictions. The captain of the gang of stevedores left the station to-day without permission, as is believed for the city, as also did one of the barges with her crew, neither of which was intended to have been permitted, nor should they be allowed to enter and remain in the city." This lighter was found to have carried away a load of logwood received from the deck of the Home, and to have landed it at the logwood wharf, situated on the west side of Windmill Island, opposite the city, where it remained several weeks.

Two days subsequent to the date of the foregoing letter, on the 15th July, Dr. Thompson informed the Board that on the brig Home were found five or six hundred pounds of filthy old rags, purchased, it is said, by the captain at auction, either in Porto Rico or Jamaica. They were stowed away in the cabin, and were seized by the custom house officer at the lazaretto. Being believed to be infected and unfit to be moved or handled, the doctor had them burned, a measure approved by the Board. On the 18th, the Board passed a resolution to the effect that the barge James Kirkpatrick, Captain Doggett, family and crew, be permitted to leave the lazaretto for Smith's Island to discharge her cargo, and immediately thereafter proceed up the Schuylkill River, to her place of destination, without touch-

ing or allowing any one on board to enter, the city; said barge to be placed under the supervision of a vessel inspector. The barge James Kirkpatrick, however, was not *permitted up, for cause.* The Home being, as stated on the 19th, completely discharged, was cleansed and fumigated; her cabin was painted and her hold whitewashed.

It remains to be stated in relation to the movements of the Home, that on the 4th of August, through a mistake on the part of the then acting officers of the station, the vessel was permitted to proceed to the city, and that on coming up she anchored, at first, in the stream on the west side of Windmill Island, and was immediately after, ordered to lay in the stream on the east side of the island opposite Spruce Street, where she remaind all night. As soon as the mistake was brought to the knowledge of the Board of Health, and before the vessel had been removed close up to the shore, she was, though apparently clean and disenfected, and as a matter of precaution, ordered back to the quarantine station, where she was taken by the health officers and remained at a proper distance from the buildings and under strict surveillance till the close of the quarantine season, when she was released.

Soon after the Home had reached the station sickness began to show itself on board or to be traced to the exhalations issuing from her, but became more rife and assumed a disposition to spread after the hatches were opened for the discharge of the cargo. The day after her arrival—30th of June—the pilot, Stephen Bennet, solicited and obtained permission from the lazaretto physician (as is usual in such cases) to proceed direct to the breakwater without visiting the city. Instead of complying faithfully, as he had promised to do, with this permission and obeying thereby an explicit provision of the law, he went no further than Wilmington, when, feeling indisposed, he turned back and proceeded, not to the quarantine station, but to Philadelphia, where he died after five days' illness with decided symptoms of yellow fever. On the 2d of July a sailor from the vessel, Joseph G. Elliot, was taken with the disease and sent to the hospital of the station and recovered. A French sailor, Olivier Pierre, after his discharge from the brig and while in the city, was similarly attacked, and after remaining a few days in a boarding-house, and being refused admittance into the Pennsylvania Hospital, was conveyed to the Municipal Hospital, where he recovered after having thrown up black vomit, and presented other well-marked symptoms of the fever. The second-mate who, as we have seen, absconded from the station on or about the

30th of June, was some time after ascertained to have sickened in the city on the 3d of July and died a few days after—the 6th—of the fever, the efficient cause of which he must have imbibed in the vessel. The next case, in the person of one of the stevedores, William Henry Sylvester, occurred on the 17th. He was admitted to the hospital and recovered. Two days after, on the 19th, three more patients were reported: Mrs. Jane Doggett, the wife of the captain of one of the lighters; Thomas Doggett, his son; and one of the men employed on board. The first two of these died—the former on the 23d and the other on the 22d. The third patient recovered, as well as another of the same crew who was taken sick of the fever on the 24th.

The family of Mr. Pepper, whose residence, as already stated, faces the river at a short distance from the lazaretto boundary and close by the wharf at which the Home was being discharged, was severely visited by the fever, which did not spare friends who spent a few days or hours at the house. Ann Sharp, a servant girl, was taken ill on the 22d and died on the 29th of July. Mrs. Ennis, Pepper's mother-in-law, an old person over eighty years of age residing with her daughter, and who was not known to have been on the wharf while the brig lay there, was seized with the fever on the 23d of the same month and died on the 28th. Mr. Pepper himself was attacked on the 31st and died August 7th. Mrs. Clendenning, residing about a mile and a half north of the station, who attended Mrs. Ennis's funeral, which took place on the 31st, and remained at the house about four hours, sickened on the 6th of August and died on the 18th. Mary Johnson, housekeeper, was attacked on the 6th of the last-mentioned month and recovered; while Mr. Harrison, a cousin of Mrs. Pepper's, residing in Kensington, who attended the funeral of Mrs. Ennis and remained three days at the house, was seized on the 8th of August and died a few days after his return to the city. Finally, Mrs. Pepper's sister, Mrs. Borden, was attacked on the 22d and recovered.

Extending next its effects to the officers and employés of the station, as also to their families, many of whom had not visited the ship, the fever attacked and carried off the lazaretto physician—Dr. Thompson—and the quarantine master—Mr. Robert Gartside—the former of whom was attacked on the 2d of August, and died on the 10th, while the latter was seized on the 6th and died on the 12th. Mrs. Thompson, the wife of the doctor, and his daughter, Lizzie Thompson, were also attacked—the one on the 5th, and the other on the 4th—but recovered. The wife of the steward—Mrs.

Kugler*—died on the 8th, after an illness of six days; and Fanny Gartsell, the head nurse, on the 10th, after seven days' illness. The gardener, William Dillmore, was attacked on the 6th, and died on the 13th. Charles Hancock, the carpenter of the lazaretto, sickened soon after reaching the city, and died on the 14th of August, at the Municipal Hospital. To this list must be added two regular nurses and a woman who volunteered her services in that capacity; as also a man of the name of William Hess, assistant gardener, and John Cavister, captain of the barge James Madison. One of the regular nurses died, the other recovered; while the volunteer nurse, who sickened after her return to the city, also recovered. Two of the other patients died—Hess in the city, where he went through the disease, and Cavister in the quarantine hospital.

Several more cases are stated to have occurred at a short distance west of Pepper's house, and one within the boundaries of the lazaretto; but being more than doubtful as regards the yellow fever nature of the symptoms they presented, the information about which was obtained from a source entitled to little confidence, I omit them in this enumeration.

I omit, also, some servant girls in the employ of Mr. Kugler, who were taken sick towards the latter part of July, and were slightly indisposed for a few days. One of them, as Dr. Taylor informs us, subsequently, by imprudent exposure, contracted a severe cold, which confined her an additional period. Nor do I include a few other cases which occurred among Mr. Pepper's children; for though they sickened but a few days before the yellow fever broke out in the family, and they had been on the government wharf to see the Home while her cargo was being discharged, their attacks were of a mild character, and devoid of the symptoms of true yellow fever, and were supposed by Dr. Thompson, who attended them, to have been of a common malarial nature.

Thus it results that, in a population exposed directly and indi-

* The following well-merited tribute to the memory of this estimable lady I borrow from the report of Dr. Taylor, the present lazaretto physician: "Zealous in good works, kind, attentive, and self-sacrificing to a fault, where sickness and trouble existed, she gave her time and services freely both day and night as well to her afflicted neighbors as to the wants of the patients in the hospital; and it may be truly said of her that she was always found at the post of danger, never shrinking from any duty wherein it was possible to relieve suffering or to assist at the last sad rites preceding sepulture. Her many excellent qualities and unvarying kindness will long be held in grateful remembrance by those whose privilege it was to know her under circumstances which called forth the exercise of those virtues which so pre-eminently marked her life."

rectly to the infection of yellow fever—including the stevedores employed in discharging the brig, the crews of the lighters, the Pepper family and their immediate neighbors, as well as the bargemen, officers, and other employés of the lazaretto, amounting to little over one hundred (103)—the disease attacked twenty-nine individuals, or one in about 3.55, and caused a mortality of eighteen, or one in about six, of the population, and over one in two of the sick. No *post-mortem* examinations were made at the station; but the few made at the Municipal Hospital among individuals who had taken the disease from the infection of the *Home*, satisfactorily established the yellow fever nature of the disease, which there and at the station was unmistakably diagnosed from the general and local symptoms, the appearance of the surface and eyes, the well-known metaptosis, the discharges from the stomach and bowels, etc. Some of the cases were of longer duration than usual before the supervention of black vomit and death—the patients remaining in an apparently mending state for several days. In one case—that of the quarantine master—the disease commenced as a simple diarrhœa attended with slight tenesmus. This continued with little change till the fifth day, when black vomit and other bad symptoms supervened, and were soon followed by death.

In the instance under present consideration, the infection or poison producing the disease was undeniably located in the Home; for it affected individuals who had sailed in her from Jamaica, and others who after her arrival, visited her on official business or were employed in discharging her cargo, as also some who merely worked, walked, or resided in her vicinity. How this poison got on board so as to produce the fatal effects here recorded—whether the poisoned air was inclosed in her at the port of departure, or was evolved, during the passage, from the contents of the hold and other parts of the vessel, or the timber entering into her construction, is a question upon which I shall not dwell, except to say that while it is not improbable that the Home imbibed, while taking in cargo in the infected ports of Jamaica, a large share of the poison, and carried it in her inclosed hold, on her return home, we are fully justified, from her excessively filthy condition, and her after history, in the conclusion that the efficient cause of the disease was in great part generated on board. More I need not say. Especially do I deem it unnecessary to notice seriously the possibility of the poison pervading the vessel being the result of emanations from the bodies of the captain, who, as we have seen, died of the disease, and of the cook, who labored under the same prior to the arrival of the vessel at quarantine. But whether derived from one

source or another, sure it is that it was located on board, and affected those who breathed the poisoned atmosphere circulating in the hold, cabin, &c. Neither can we entertain any doubt as to the manner in which the disease reached those who were on shore, at a greater or less distance from the source of infection and had not visited the vessel, and was disseminated in various directions after it broke out among them. That it was through means of contagious communication, of the sick from on board with individuals on shore, no one can believe who bears in mind that the contagious nature of the yellow fever has never been satisfactorily made out anywhere, at sea or on land, north or south; and that even supposing that such an opinion as regards the truth of this mode of transmission finds support in facts observed elsewhere; even supposing, too, that diseases possessing contagious properties, and spreading through their agency, are ever found to be transmitted from place to place in accordance with laws which govern the diffusion of malarial and non-contagious complaints—a fact which experience teaches us is not the case—a belief in such a mode of transmission finds no support in the occurrences above referred to, for none of those who having contracted the disease in the vessel, or having sickened on shore, and gone through its various stages, whether in the city, in the open country, or at the Municipal Hospital, and there recovered or died—and whatever was the location or the condition in point of cleanliness, ventilation, &c., of the houses or rooms in which they were placed—none of those, I say, communicated it to persons who came in contact with them —relations, friends, nurses, physicians, &c.; and surely if they were not the agents of infection there, we cannot suppose they could have given rise to a different effect at the lazaretto. Nor is it less certain that many of the individuals who sickened at the station had not communicated in any way with patients from the ship or with each other. Let it be added that the result could not have arisen through means of fomites—(limiting that term to mean the clothes, bedding, and other personal effects of the sick, and excluding decomposed cargoes and timber)—not only because the possibility of this mode of transmission has never been proved, but because such fomites were in great measure destroyed by fire at the station; because those who washed the balance were not more affected than those so engaged; and, finally, because articles of the kind used by the sick in the city and at the Pennsylvania and Municipal Hospitals, and which were there handled and washed, did not communicate the infection to the individuals busy in performing that task.

The true explanation of these occurrences is that those who so suffered from the disease on shore received the infection from the ship through the agency of the wind, which, blowing during part of the time from due south, or southwest, or southeast, wafted the poison on shore and thereby endangered every individual situated to the leeward of the source of infection. Such effects are not of uncommon occurrence. They are observed in all parts of the world within the fever zone, in regard to diseases arising from the action of malaria to the class of which yellow fever, though not due to exactly the same poison, is closely allied. It is a fact well known to medical readers that certain localities—rural districts, towns, or cities—which themselves do not contain any of the elements of unhealthiness, and under ordinary circumstances, remain free from autumnal or periodic fevers, become, at times, the seat of the latter, when so placed to the leeward of infected districts as to receive from these, through the agency of the wind, the pestiferous miasmata evolved from their marshy surfaces. Facts, indeed, might easily be accumulated to show that in many fenny portions of the globe each locality has its favorable and unfavorable winds. With the latter fever abounds; with the former it diminishes or disappears; and it is found that this difference depends on the position of the marshy or infectious surface relative to that locality, and also on the circumstance that, in the one case, the wind passes over the source of the effluvia before reaching the sickly place; while, in the other, it takes an opposite course, and leaves the latter untouched. As I have stated in another place, from the diversity of result arising from the same wind, and the sameness of effect resulting from currents of different character, we derive the proof that no particular wind can be said, with any show of reason, to constitute by itself the necessary and efficient cause of malarial fevers, and that whenever any of them exercises an agency as regards the origin or diffusion of the disease, it derives that power not from the fact of its coming from any particular quarter, but, in some measure, from the temperature and hygrometrical condition of the moving column of air, but more especially from the injurious effluvia it raises from the localities and surfaces over which it passes, and which are carried along with it. How far the degree of heat thus created, or the hygrometrical condition of the air thus promoted, is instrumental in aiding in the development of the disease need not detain us here. Let it suffice to state that excessive and long-continued heat, as well as dryness and humidity, should be held only in the light of predisposing or exciting causes of the disease, and that if they exercise a different and more direct agency in its production, it is by

aiding, through the peculiar conditions of atmosphere they occasion, in the development of effluvia injurious to health and contributing to their dissemination to more or less distant parts. Scarcely a place visited by the disease can be pointed out in which conditions of locality favorable to the evolution of the yellow fever cause may not be discovered; and wherever such is the case, and the degree of heat and humidity required for the production of this cause exist, it will be wafted by the wind which may chance to blow over the infected district before reaching such localities as are exposed to its action.

In enumerating the general causes which produce or dispose to ill health in St. Domingo, Dr. Hector McLean mentions the bad winds which prevail more particularly in June and July. To guard against their effects the inhabitants "shut their doors and windows, and go out as little as possible whilst they prevail." Dr. Lind, who is good authority on subjects of the kind, says that when a ship at anchor is near marshy ground or swamps, especially during summer or in hot weather, and the wind blows directly from thence, the gun-ports, which would admit such a noxious land breeze, ought to be shut, especially at night; or, if the ship rides with her head to the wind, a thick sail ought to be put upon the foremast, along which the smoke from the fireplace might be made to play and ascend. Long after the days of Lind, another British naval medical officer of experience in all that has relation to subjects of this kind, Dr. Wallace, has dwelt on similar points. "On land, the opening of tents in encampments, situated in the vicinity and to windward of unhealthy spots, should be invariably to leeward; and, if possible, there should be a barrier of some kind, as a piece of rising ground, between them and the quarter whence the wind blows. If a vessel be on a windward coast, and the soil is such as to give out pestilential miasmata, she should avoid, in as far as she can, any close approximation to the shore; she ought, especially, to be protected forward or at the bow; for, as a general rule, when a vessel is at anchor, she rides 'head to wind,' or with her bow to the breeze; and, for the purpose of protection, 'the ports should be closed during the night.'"

But it is not necessary to dwell any longer on this subject, allied as it is to a fact known to all physicians, that the course of malarial fevers is wafted by the wind, and that its extension or diffusion is arrested by trees, walls, hills, rows of buildings, canvas, and other such obstacles.

Not different is it, nor can it be, in regard to yellow fever. The reader, I feel convinced, will not refuse his belief to the fact that

the yellow fever, though far from being identical with, or a merely aggravated form of, ordinary malarial fevers, is nevertheless of the same family of diseases. Arising from local sources of infection, it is, like them, a malarial fever also; and the poison by which it is produced, however varying from those which give rise to the several forms of the above-mentioned fever, does not possess, when carried elsewhere in ships or otherwise, properties very different from those with which the others are endowed. In the country, the efficient agent-giving origin to those fevers is generated in swamps and other humid places where the recrements of plants and insects are subject to decomposition; in towns, where yellow fever prevails, or places, ships, &c., where it occasionally breaks out, other vegetable recrements, animal effluvia, and exhalations and secretions from a dense population, are subject to the same decomposition. But as the decomposable materials are not identical, the products of the fermentation cannot be identical. The rural malaria produces one modification of fever, the civic or ship malaria another. In other words, the yellow fever, though belonging to the same class or family of diseases as the ordinary forms of malarial complaints, nevertheless differs from them to a sufficient extent, in regard to phenomena, to justify us in regarding it as constituting a separate and distinct complaint, arising from effluvia constituted of different elements, themselves produced by the decomposition of different materials, perhaps of different proportions of the same elements proceeding from the decomposition of similar materials, but under the influence of peculiar external agencies. This view of the malarial nature of yellow fever and its classification with other fevers, differing so materially from it in their phenomena, cannot be matter of astonishment, when we bear in mind that diseases, indubitably due to kindred miasmal emanations in different or the same countries, present differences of more or less notable character. That the poison of remittent and intermittent fevers is the same we must admit; for these diseases are daily converted into each other in the same individual, and when a number of individuals are exposed to the same paludal effluvium, it not unfrequently happens that, while some are affected with the one, others are stricken down with the other form of the disease. Everywhere they are recognized as the offspring of malarial emanations—as strictly malarial fevers—and yet they are not identical in character and form wherever they prevail; while they differ greatly from other febrile complaints, the miasmal origin of which is no longer denied. In another place I have called attention to the fact that the "Jungle fever" of India is not exactly the same in form as the remittent of Africa; the

fever of Batavia differs in some respects from the remittent of this country or of the Gambia. The febrile diseases of Rome are not precisely similar to those of the West Indies or of Batavia; and the Walcheren fever differs in like manner from the like complaint of both, or from that of Breslau. In France, the fevers of Rochefort do not present exactly the same characters as those of Bresse and the plain of Forez. The Mediterranean remittent, described by Sir W. Burnett, is somewhat unlike the periodic fevers of England, or of Northern Europe. It differs, too, in some particulars from the fever of Greece, and from that of Algeria or the Morea; and surely it would not be possible to mistake either of them for that form of disease which prevailed among the negroes of this city in 1820 and 1821, and about the same time in Banker Street, New York.

Differing, however, as the yellow fever does in many of its characteristic phenomena, from other forms of febrile complaints with which it is allied by the malarial nature of its efficient cause, it is governed in its mode of extension and diffusion by the same laws as preside over the others. Hence, like them, when it originates in any locality—whether in the West Indies, on the coast of Africa, in Europe, in this country, or elsewhere—or when it breaks out in a ship, and by the latter is carried to any place, it usually spreads to a greater or less distance in the direction of the prevailing wind, and spares localities situated to the windward of its original source, or protected from its effects by some means of shelter; for as occurs, in regard to the ordinary forms of malarial fever, the extension and diffusion of the disease under consideration "is arrested or mitigated by trees, walls, rows of buildings, canvas, and other such obstacles."

Thus, as Dr. Rush informs us, several families in 1793, who shut up their front and back doors and windows, escaped the disease. It is probable, indeed, let it be remarked, *en passant*, that the benefit accruing from seclusion in times of severe epidemics of yellow fever may be explained in that way, and not, as it is supposed by some, by the avoidance of individuals affected with the disease, and of objects supposed to be contaminated with the poison.

In Boston, in 1798, the south winds wafted the exhalations from the wharves, stores, and docks at the foot of the hill upon the inhabitants that resided on those sides of it. The same winds, southeast and south, produce the same effects in New York. The winds during the summer are generally from the sea, and arrive at the lower part of the city uncontaminated by passing over unwholesome ground; yet such is the fact that the poisonous exhala-

tions, which abounded in that quarter during the warm weather of 1795, so changed the air that the inhabitants on the south side of Pearl Street, between Old Slip and Whitehall, almost all concurred in their testimony that the disagreeable effluvia frequently compelled them to close their windows, especially in the evening, on the south side of their houses. A similar influence of the wind was noticed at Sierra Leone in 1823, as inferred from a review of the cases of fever which occurred in the shipping in the harbor, and from the situation of the houses in Freetown, in which the disease prevailed. "The ships suffering," says Mr. Boyle, "were invariably exposed to the northeast winds; and in the town the fever limited its course, and in the most striking manner, to those houses between which and the northeast winds passing over the Bullom country there was no obstruction." In 1838, the epidemic of Martinique broke out in localities most exposed to the action of southerly winds. The south winds in that island, as we learn from Dr. Lefort, blow the effluvia from the port, and the parts of the coast where sources of infection abound, over the town of St. Pierre.

In Barcelona, during the epidemic of 1821, it was found that while the wind blew from the southwest, which was the case in the early part of the season, the disease extended from the port to the village of Barcelonetta; but that when later in the season the course was generally from the south, and especially from the east, the fever soon spread to every part of the city which lay in that direction.

It not unfrequently happens that ships take the disease by approaching near an infected port or place, and remaining within range of the wind blowing off the latter. On the other hand, vessels that are infected in such localities lose the fever (if they themselves do not contain sources of infection) by shifting their position and anchoring at a distance—sometimes at a very short one—from the shore; or by going to sea, and thereby placing themselves beyond the influence of the land air.

In his account of the yellow fever of Georgetown (Demerara), Dr. Blair states that, in the beginning of 1839, the ship Thomas King lay in the division A, between Kingston and Wighart's stellings—a main focus of the disease. In one week she lost four hands. She unmoored, and took her station *outside*, or to the leeward of the Louisa Baillie; the mortality ceased, and the health of the crew became reëstablished. The Louisa Baillie, that had been right abreast and sheltered by the Thomas King before the unmooring, and had no death, although several cases of fever, which readily

yielded to treatment, became soon very sickly; she lost four men; after which she shifted her moorings, and the mortality then ceased in her also.

When we find such effects to occur in regard to the yellow fever on shore, its being wafted from one locality to another, from the shore to vessels in the vicinity, &c., no one will doubt the possibility of similar effects resulting from the carrying, through the agency of the wind, of the pestiferous air of an infected ship to a shore situated at a greater or less distance to leeward of the latter, and the subsequent development of those fevers among persons exposed to the wafted poison. Of such occurrences many examples are on record, several of which are of sufficient interest to be placed before the reader.

The Hecla bark, a wooden sailing vessel, left Cuba on her return to Swansea, South Wales (51° 37′ N. L. and 3° 55′ W. L.), on the 26th of July, 1865, with a cargo of copper ore; and arrived on the 2th of September. She had a clean bill of health, and it was thought and stated, that no infectious disease prevailed in any degree at the place from whence she sailed. She was placed in the north dock alongside the Cobre wharf, in the usual discharge berth, situated on the west side of a narrow and long island which divides the river *Tawe* into two parts just before entering the harbor, the west branch of which river is formed into the above-mentioned dock by a lock placed at each end. A good many people went on board her as she entered the dock. Within an hour of the ship's arrival two passengers were landed with their baggage, while the crew had left the ship and had distributed themselves over the town. Within three hours of the vessel's reaching the port the hatches were removed, a stage rigged, and gangs of men commenced discharging the cargo. During the voyage home the Hecla lost three of her crew, and on arrival three men were landed sick, two of whom were recovering from fever, while the third, named Saunders, the captain reported ill of dropsy. Saunders died the next day in the town with unequivocal signs of yellow fever, and there was every reason to conclude that the others who landed were convalescent of the same disease, and those who had died during the voyage had done so from the same fever. A good deal of public anxiety soon existed about the Hecla, and about the possibility of the disease spreading from the house where the *soi disant* dropsical patient had taken refuge, or from the rest of the crew. The body of Saunders was put into a tarred sheet and buried within four hours of his death. The house where he died was immediately emptied and disinfected with lime-wash and chloride of lime, and for further safety all the houses

near by were similarly treated. The bedding and clothing of the dead man were destroyed, and the house was again cleansed and disinfected before it was allowed to be tenanted, a week after. Besides this, the police was set to find out the passengers and the crew of the Hecla, while the sanitary inspector was sent to have their clothes and rooms and persons fumigated with chlorine.

After much consultation and confusion among the authorities, the unloading of the vessel was stopped and the hatches shut down, but not before some thirty tons of the ore had been taken out and placed in the Cobre yard. Measures of purifying the ship consisted in washing the decks and forecastle with chloride of lime, and copious evolutions of chlorine in the forecastle, steerage, hold, and places of storage, were now had recourse to and continued till the 12th September. The fumigation of the ship being completed, the police were removed, and communication with the vessel was permitted. The next day she began to discharge her cargo, and finished unloading on the 20th or 21st of September, lying all the time alongside the Cobre company's yard, into which her ore was taken. The Hecla, some days after unloading, was transferred from her place near the aforesaid wharf into the Beaufort dock, a branch of the North dock, at some distance from her former position, and surrounded by high warehouses.

After Saunders's interment, and after the precautions described had been taken, no further alarm appears to have been felt about yellow fever; but on September 23d, about the time of the vessel's removal, the Registrar of births and deaths, in Swansea, got a medical certificate that a death had occurred from yellow fever, and heard it reported that other cases were about the town. This proved to be the truth; for it was soon ascertained that many cases of true yellow fever occurred, and that all were traceable to the Hecla. Every circumstance, indeed, connects the disease with it, from "the fact that there had been for months no other vessel in the harbor that had had any yellow fever on board," and "from a consideration of dates." A vessel which has acknowledgedly lost part of her crew from yellow fever, and which lands a man on her arrival to die of that disease in a few hours, enters Swansea on September 9th, and remains there till September 28th. "From the 15th September, six days after her arrival, to October 4th, six after her departure, cases of a disease previously unknown at the port, with the symptoms and fatality that mark it for yellow fever occur. The vessel leaves the dock on September 28th, and takes up a position near the harbor mouth, and from October 4th to October 23d, the date of this report, there is no fresh case. The locality where the

disease broke out again connects it with the Hecla. In a town of thirty thousand people, some eighteen cottages are scattered on a little low-lying island, to which the vessel importing yellow fever comes, and on which she discharges her cargo. Of the twenty-two cases of the fever (excluding doubtful cases of it that subsequently broke out), eleven occur in persons resident of the little island; five in persons who, living elsewhere in the town, have their daily work on the island, three in men occupied about shipping in the North dock, and only two cases occur among the whole population of the large town who had no direct connection with the island. But even these two cases occur in persons living within one hundred and fifty yards of the ship across the dock." To this it must be added that, "a vessel lying close to the Hecla, while her cargo was discharging, left Swansea for a neighboring port (Llanelli), and lost two of her crew of fever, one of them certainly from yellow fever."

It is remarkable, while disease was in all instances traced directly or indirectly to the Hecla, that we are told that "the pilots, the seamen who helped to bring the ship into the harbor, the custom-house officers and men, and *almost* all the men employed in discharging the cargo, escaped an attack of the fever." But "for this circumstance," as Dr. Buchanan, the historian of the event, remarks, "no explanation can yet be offered; but it is one which has many parallels in etiological researches, and cannot be held to constitute a material difficulty in affirming a connection between the Hecla and the fever on shore."

It is well to add that during this period an almost tropical heat prevailed at Swansea, and no rain fell. "Probably the climatic conditions that foster yellow fever in the West Indies have never been better imitated in Great Britain. The locality, too, where the cases occurred, a low-lying alluvial island at the mouth of the river, is such as is particularly favorable to the disease in its native latitudes."

As already stated, between the 15th of September, when the first case occurred, to October 13th, when the last patient became convalescent, there were twenty-two cases in which the diagnosis of yellow fever could pretty certainly be made out, and seven other cases in which the circumstances of exposure or the character of the attack led to a more or less strong suspicion that the illness was of the same nature. Of the cases diagnosed yellow fever fifteen died besides the man brought by the Hecla, and seven recovered. Of doubtful cases one died and six recovered. All the individuals but two resided on the island at a longer or shorter distance of the ship, and those who did not go on board were exposed to the poisonous

effluvia which was wafted on them from the ship by the wind, which being during almost the whole season from the West, N. N. W., S. W., N. W., W. S. W., N. E., &c. &c., passed over the ship before reaching them. As regards the two cases who resided on the other side of the dock where the Hecla was moored, and had no connection with the island, it may be stated, that though the prevailing winds were generally from the west, they blew on several occasions from the other side of the compass and over the vessel, and hence carried the fever poison from the focus of infection to the place where those individuals resided.

Several circumstances connected with the development and spread of the disease militated in favor of its contagious property and were, as might be supposed, adduced in support of that hypothesis. "On the other side," as Dr. Buchanan says, "the evidence tending to negative personal contagion is about as strong as such evidence can by its nature ever be." "Persons exposed to the fever-producing influences about the docks lay sick of the yellow fever in various parts of the town, and there recovered or died, and yet no extension of the fever occurred at either of those places. There were many—not less than twelve centres—from whence the disease, if it had been communicable from person to person, had the opportunity of spreading, and many of these localities were perfectly adapted for the spread of contagious diseases, yet in no single instance out of all these did any person (whose business did not lead them to the infected neighborhood of the docks) get yellow fever or any disease at all simulating it. The conclusion then appears indisputable, that if the fever was communicable at all by personal contagion, it was only in an extremely feeble degree. If it had behaved like any of the contagious fevers, such as smallpox, measles, typhus, or relapsing fever, it is quite certain that no such account as this could be given. The contrary belief, that infection was received by each person severally direct from the Hecla, is further rendered very strong by the fact that after the removal of the Hecla (and allowing for the incubation of persons already infected) no fresh attack whatever occurred on the island or elsewhere, although climatic conditions persisted for some time after."

Another case in point may be cited. The French ship, the Anne Marie, a wooden sailing vessel of Nantes, 47° 17′ N. L., sailed from that city in March, 1861, for the Havana, where she arrived on the 12th of May. She sailed on her return home on the 13th of June following, up to which time her crew, to the number of sixteen men, remained in good health. So they continued, though the yel-

low fever prevailed extensively both among the shipping and in the city, till the 17th day after they had left port, when the disease broke out on board. The cases, nine in number, succeeded each other rapidly. Of these two died. For sundry reasons it is not necessary to mention, the vessel, instead of returning to Nantes, made for Saint Nazaire, a small port situated on the ocean at the mouth of the Loire, and a short distance from that city. She arrived there on the 25th of July. The weather at the time, and for a while after, was extremely hot, and like that of a tropical climate. At the time of arrival of the vessel twenty days had elapsed since the last death and thirteen since the occurrence of the last case on board. It may be remarked that, according to the sanitary laws of France, vessels arriving in ports situated on the Mediterranean, Marseilles, Toulon, Cette, &c., from places visited at the time by yellow fever, are subjected to a quarantine of seven to ten days, while, on the contrary, in ports situated on the ocean, Havre, Cherbourg, Brest, &c., such vessels are admitted at once to *pratique*, if at the time of arrival ten days have elapsed since the occurrence of the last death or case on board. Being strictly within the letter of the law, the Anne Marie was admitted to free *pratique* and allowed to take position in a magnificent basin recently constructed at that place, to discharge her crew, and commence the removal of her cargo, which consisted exclusively of boxed sugar. This operation, which was commenced on the 27th of July and completed on the 3d of August, was effected by a gang of seventeen strong and healthy laborers from Saint Nazaire.

Near the Sainte Marie lay two government vessels. One of these, a small tug, left on the 29th, with a crew of four men, for *Indret*, a small town on the Loire, twenty-four miles from Saint Nazaire. On the 1st of August one of the men was attacked with unequivocal symptoms of yellow fever, and died after a few days' illness. Three other cases soon followed and proved equally fatal, while the fifth and remaining member of the crew died of the same disease at a somewhat later period.

While such were the results obtained at *Indret*, like events occurred on board of the other government vessel referred to above. Leaving Saint Nazaire it reached L'Orient on the 10th of August. Four days after, the disease broke out on board and proved as fatal as elsewhere. It attacked also other government and merchant vessels that lay or had lain near the Saint Marie, one at sea on her way to Cayenne, several in port, and some, again, after they had sailed and reached their places of destination. About the same time the mate of the infected vessel, as well as some of

the men who worked on board, were attacked. Nor did the disease spare persons on shore, whether they had approached the culprit ship or had remained at a considerable distance from her. The total number of cases amounted to forty-four. Of these twenty-six died and eighteen recovered, showing a proportional mortality of 59 per cent.

Of those who were attacked, a number had doubtless been on board, as workmen or simply as visitors, and there imbibed the seeds of the fever. But, on the other hand, the disease, as already remarked, spread among individuals who kept aloof from her, or even remained or resided far off. To them, therefore, the febrile poison must have reached in some indirect way. In several cases the occurrence was by some attributed to the agency of fomites, for the individuals had handled objects derived from the vessel, as clothing, old sails or ropes, and the like. In other instances it was stated that the sufferers had contracted the disease through means of official or social intercourse with those who had worked on board or visited the ship. But in as many, or more, instances, such explanations could not apply, inasmuch as no such indirect communication with the infected vessel was ever traced.

The crew, as already stated, were discharged soon after the arrival of the vessel. They immediately left Saint Nazaire—some of them still in a state of convalescence—for their respective homes, carrying along with them in their clothing or about their persons, as might have been supposed, the infectious germs of the disease. Nevertheless, neither did these, nor persons who, having imbibed the poison, and sickened, either on board of the Anne Marie, or in the town, or in vessels subsequently infected, and went through the several stages of the disease, to recovery or death, in neighboring or distant villages, communicate the infection to their friends, relations, or attendants. In one solitary case was the disease suspected to have manifested decidedly contagious properties—that of a physician, who, after paying two visits to a patient who died of the fever, at the distance of a few miles from Saint Nazaire, was himself seized with it a few days after and died. But even this case, which is regarded by the reporter of the event, Dr. Mélier, as proving beyond denial the occasionally personal contagiousness of the fever, on the ground that the subject of it had not visited Saint Nazaire, and must therefore have contracted the disease from his patient, does not appear to me to lead to such a conclusion. In the first place, none of the other physicians who attended the sick man in company with the sufferer in question, and, indeed, visited him more frequently and assiduously than the latter, as well as none

of the sick man's friends and nurses, were affected. Neither did the physicians who attended the doctor, nor his nurses, friends, and his faithful wife, who waited on him to the last, contract the disease; and surely if the fever was of a sufficiently contagious character to have been communicated by a patient at a distance from any source of infection to one of his professional attendants, it could not be reasonably supposed likely to spare not only all his other physicians, but also every one else about him; as well, indeed, as all the medical attendants, nurses, relatives, and friends of the sick physician. In the second place, we have reason to believe that the statement made by Dr. Mélier, founded on information he obtained at the time of his visit to Saint Nazaire, and which he regarded as authentic, that the doctor had not approached the town for a long time prior to his attack, is incorrect, inasmuch as Sir A. Perrier, British Consul at Saint Nazaire, eventually found that the doctor had in truth been exposed to chances of direct infection from the ship.

Let this be, however, as it may, it is a fact placed beyond the possibility of a doubt, that in all authenticated instances the disease was traced to the Anne Marie; that all the cases that occurred in vessels anchored near her, did so exclusively among such of those vessels as were anchored to the leeward, *i. e.*, those to which the poison was wafted by the wind that reached them after passing over the focus of infection, and thereby becoming impregnated or charged with the deleterious effluvia issuing from her. While such was the case on board of those vessels, others at anchor on the windward side of the Anne Marie universally escaped. Similar results obtained on shore; the disease being transmitted to the leeward of the infected vessel, and in no instance in an opposite direction.

Not different from the occurrences at Saint Nazaire were those observed in 1821 at Pomégue, the quarantine ground of Marseilles, where a Swedish vessel, the *Nicolino* from Malaga, infected several vessels undergoing quarantine at a greater or less distance from her, communicating the fever to those to leeward and invariably sparing those to windward. The same may be said of the *Donostierra*, in 1823, at the port of Passages, a small place situated in the province of Guipuscoa, at the bottom of the Bay of Biscay, and forming a sort of appendage to Saint Sebastian; of the ships *Ocean* and *Favorite* from the West Indies, which communicated the fever at Perth Amboy in the summer of 1811, and of the brig *Sea Island* from Savannah, which did the same at Middletown, Connecticut, in 1820. In reference to the occurrence at Amboy I have only room to remark, that several persons had gone on board of the vessels above

named; but several of those attacked had not approached them, and even lived at considerable distances: the wind, however, blowing all the time from the vessels towards their dwellings. "It will be readily observed," say the reporters of the event—all decided contagionists—"that the same wind which blew the effluvia of the bilge-water, would also convey the poisonous vapor from the adjoining vessels." Let it be mentioned in regard to the *Sea Island*, that the vessel anchored opposite to Middletown. As had been the case at Amboy, some of the persons who visited her sickened with the fever, while others who were equally infected had kept aloof. She was sent up the river, some four and a half miles from the centre of the town, to a cotton factory, near a place called the Upper House, situated in a pleasant valley, and without any houses in the immediate neighborhood. Here the fever followed. "It is true," says Dr. Beck, who was sent from New York to investigate the subject "that all the cases cannot be distinctly traced. This, however, is immaterial. The fact that somehow or other the disease with the presence of this vessel stares us too broadly in the face to admit of a denial." The distance between the factory and the river was perhaps about half a mile. "It may be deemed by some of consequence to state that the factory had been closed for some time, and that they commenced working in it only a short time before. There were only seven girls and three men employed in it. Such were the circumstances of the factory when John Wild, one of the men, was taken sick. I cannot learn that Wild was aboard of the brig Sea Island, though at the time he was taken sick she lay opposite the factory, but on the other side of the river where she had grounded." He was attacked on the 19th of June, and died on the 25th. One of the girls was attacked on the 21st, and recovered; a second on the 23d, and died on the 27th. A third girl had the fever and recovered. It does not appear that either of these girls had been on board of any vessel. Some of them had been down to Middletown; but at the time they did so the Sea Island lay four and a half miles above that place. They, therefore, contracted the disease at the factory, to which, though half a mile distant from, but to leeward of, the vessel, the infection was wafted by the wind.

Much more might be said in reference to the foregoing and other kindred cases of which I have taken notes. But too much space and time have already been allotted to the subject, and I must hasten to close, after dwelling a few moments on two more instances illustrative of the question before us, as more striking and likely, from the place of their occurrence, to prove interesting to the American

reader. In 1848 the yellow fever prevailed on board of several infected vessels at the New York quarantine station, then situated on Staten Island. Dr. Smith, of that place, informs us that the disease soon broke out on shore. "Most of the cases occurring from its commencement, on the 19th of August, up to the middle of September, were probably communicated through the medium of the air. Easterly winds had prevailed for many days together, varying from N. E. to S. E., and blowing constantly from the ship to the shore; and only those living immediately on the shore suffered, and where a building of any kind intervened so as to break the horizontal current of wind, those so protected escaped. Moreover, from the point where the vessels were anchored, taking the range of the prevailing winds, N. E. and S. E., it would just include the infected district."

For the following account of a like event in New York harbor, I am indebted to my friend Dr. Elisha Harris, who was officially connected at the time with the quarantine establishment of that city, and to whom I applied for information relative to it. From a valuable manuscript communication he had the kindness to send me, and a printed report also from his pen, which soon after reached me, I borrow the following details of the event in question. In 1856 "there arrived at the quarantine station, then on Staten Island, no less than seventy-six vessels from sickly ports, having a record of yellow fever on board or in the port of departure, and of these seventy-six, there were about twenty that had a record that indicated the presence of the cause of fever *in the ship*. The first and most positive example of this kind was that of the Jane H. Gliddon, a large and heavily freighted ship from Havana." "No element or item in the evidence of her being an infected ship, and of her cargo being wholly, or at least in part, infected, was wanting. She had a speedy passage from Havana; had no sickness at that port, except to leave one seaman there in hospital; had two deaths by black vomit on the passage; had six others sick and dying with the same disease on arrival, and sent five of them to my care on shore; and, subsequently, sent to me three others with the same disease developed at various dates."

From this, and other infected vessels, the yellow fever was communicated to the quarantine station and the immediate neighborhood. "While these events were in progress within the quarantine walls, there was a large series of like events in progress upon both our bay sides. Upon Bay Ridge, directly opposite our anchorage, there resided upon the terrace road, elevated some sixty feet above tide, and close to shore," "three most distinguished gentlemen, in

good health for men of such mature years and public cares, and who were entirely free from even the suspicion of any visit to a ship, or even to the water-side; for they were men of affairs, rode up and down the terrace, rode to and from Brooklyn, and sat upon their own open porches, fifty to eighty yards distant from the water-side, and high above water-level.

"Upon the 24th, 26th, and 29th days of July, those distinguished residents were attacked with yellow fever, and soon died of black vomit. Some four or five persons had previously been attacked in the same neighborhood; but no evidence was given to the single testimony of an observer that these were yellow fever, until the three gentlemen here mentioned were actually *in articulo mortis*. That bay side was swept with the epidemic. I alone obtained records of one hundred and forty-seven positive cases. The actual number was about two hundred and fifty."

In reference to what preceded and attended that outbreak on the Long Island shore, Dr. Harris remarks, "For a week preceding the 20th of July, the *Gliddon*, the *Ganges*, and several other badly infected ships were discharging cargo from their holds to open lighters, and lay at anchor very close upon the Long Island shore; some, especially the *Gliddon*, being within five hundred yards of the shore. The part which the infected vessels played in the epidemic was not, at last, a matter of inference, but a matter of proof. Respecting winds and weather, I would refer to my published report for an official statement, but will add here that the fact was observed, and almost daily commented upon by me and Dr. Joseph Baily, the surgeon of Fort Hamilton, that the prevailing current of air during the working hours of the days in which infected vessels were being emptied of their cargoes near the Bay Ridge shore, were from the S. W. or W., blowing directly over the vessels towards the shore. The families that resided in the direction of the wind, which swept over the lighter mooring and warehouses for infected cargoes along Buttermilk Channel, and one hundred and fifty yards distant, suffered a sudden and fatal epidemic. This was particularly the case with the garrison on Governor's Island. The first case there occurred July 29th, and the malady continued to prevail quite steadily until the 10th of Sept. "Though a very large number of cases occurred in that military command (sixty-four cases), the victims were selected exclusively from the south battery, which has a southerly and easterly exposure," and is, in consequence, most exposed to the baneful influence wafted from the quarantine station. To this last we add, that the officers in command assured Dr. Harris that no *material* cause of

infection was conveyed to or existed upon the island. Nor were these the only places to which the fever extended. Dr. Harris in his report states: "Sept. 4. Four persons, the remaining members of a family in the fifteenth ward, New York, were admitted to the Marine Hospital, two of them being strongly marked cases of yellow fever." The mother and son had died just previously, the son's illness being yellow fever with black vomit. This family had, for the purpose of sea bathing, been residing for two or three weeks at Craven Point, Bergen, N. J. The house they occupied was so situated, that at the highest tides it was nearly surrounded by water, and frequently there was much refuse material, etc., left on the beach by the receding tide. The owner of the dwelling suddenly sickened, and, after a few day's illness, died. His widow subsequently became ill with like symptoms, but recovered. During the brief interim between these events, the family from New York returned to their residence in the city, where in the course of a few days the first case of yellow fever occurred. Besides these, a man from Bergen Shore, New Jersey, was admitted to the New York City Hospital on the 22d of July, as we are informed, with yellow fever. He was a farm laborer, and had not been about from the farm for a long period. He died July 24.

"Thus did the pestilence of yellow fever invade the territory of New Jersey, and it is believed that several other cases of the fever occurred in that State, but no account of the cases sufficiently accurate for publication has yet reached me. It is well known that cases of yellow fever did occur in Jersey City during the past summer and autumn."

I am aware, and the reader must already have perceived, that Dr. Harris attributes many of the instances of the extension of the disease in the epidemic outbreak described by him, to the direct agency of fomites. We have seen also that to a like agency he referred some of the cases which occurred on shore in New Orleans, near the gun boat flotilla, at the time the fever prevailed on board of those boats in 1864. A glance, too, at his report inserted in the volume of memoirs published by the United States Sanitary Commission, will show the part he attributes to imported fomites in the origin of the fever in many of our Southern States during the late war. In regard to the efficiency of such an agency during the epidemic in question, his opinion is decided. Speaking of the mode of communication of the infection to the Staten Island and Long Island shores, he says: "By reference to the map it will be seen that all the cases are readily accounted for without requirng proof of any

material fomites in or about the dwellings of those who became the victims of the fever. But it is known that considerable refuse material from vessels in quarantine was floated to the Staten Island beach by every flood tide. Such was particularly true of the section north of the quarantine walls, and at every ebbing tide refuse materials floated and lodged upon the beach near Clifton, where the fever first became epidemic on Staten Island." In his private communication to me, Dr. Harris remarks: "The persons who picked up and handled the bedding and clothing from ships along shore, or who conveyed or were exposed to such clothing in various parts of the city, took the fever and died." Again, in his printed Report, in speaking of the infected vessels at the quarantine station, he remarks: "While lying thus at quarantine, those vessels had destroyed or cast into the bay large quantities of refuse matter, decaying fruits, old bedding, etc., and all such materials as floated on the water were carried in directions and to localities which may be observed on the map as having been subsequently the lurking places of pestilence." In the same document he remarks, "the receding or ebbing tide returns such of those floating materials as do not find lodgment about the shore just mentioned (Craven Point and Jersey City, as well as up the North and East rivers), back towards the Narrows, or down the Kill van Kull, towards Newark Bay, the greater force being in the direction of Yellow Hook, and Fort Hamilton, and Clifton. The entire beach of Yellow Hook is the grand lodging place for refuse floating materials that are borne on the receding tides of the upper bay. In that locality the pestilence first made its appearance, prevailed longest, and was most malignant."

"There can be no doubt that the most active cause of the pestilence, which more than decimated the population of the waterside in the last-named locality, was from the accumulation of infected materials floated from the vessels in quarantine. We have already noticed the extension of the fever to New Jersey shore by the same agency; and it is rational to presume that the cases of fever which were admitted from the upper districts of New York and Brooklyn received the infection from a similar cause."

"The agency of the tides, therefore, must be regarded as one of the most important and active in diffusing yellow fever from the quarantine anchorage, especially as the distance to, and the location of, the favorable points for retaining floating materials is such as to give the greatest facilities for a ready deposit of such *fomites*."*

* Dr. Harris's belief in the agency of fomites—clothing, bedding, &c. &c.—in communicating the disease far from the source of infection, has certainly been

This is not the place to inquire how far the views entertained by Dr. Harris respecting the agency of fomites in the diffusion of

carried, on this and on several other occasions, very far—further than has been done by any writer with whom I am acquainted, except contagionists of the Pym and Hosack school, and some recent young army medical officer—and leads him to attribute to it cases which, to other inquirers, would appear to admit of an explanation more in accordance with the result of the experience obtained in almost every place within the yellow fever zone, where the origin and mode of progress of the disease has been investigated by reliable and enlightened observers.

We have seen that the first two cases which occurred on Long Island beach are attributed by Dr. H. to the handling of some straw which had been left on the shore by the receding tide and removed to a neighboring farm-yard. "On the beach at the foot of Forty-sixth Street lived a Frenchman, a *chiffonier*, who had been very busy gathering and drying refuse clothing, &c., which he picked up along the shore. In this manner the district in that vicinity probably became infected." The man sickened July 25th, and died on the 28th. It must be recollected that, in speaking of the cases which occurred at Craven Point, Bergen, N. J., Dr. Harris calls attention to the fact that the house the sick occupied was so situated that, at the highest tides, it was nearly surrounded by water, and frequently there was much refuse material, &c., left on the beach by the receding tide. And, in his private communication to me, he says in reference to this event: "A single mattress—source unknown—was associated with the attack of an entire household at Craven Point, on the Jersey shore." He attributes the attack he himself sustained to his thoughtlessly assisting in steadying or supporting the body of a dying officer who was being conveyed from a ship to the barge-landing by his men, and "as his head and shoulders were resting upon a pillow brought with him from ship" (which pillow was returned immediately to the ship), while the patient was on his way to the dock stairway where the litter-bed was in readiness. He attributes the cases which occurred at the quarantine grounds and the neighborhood to bales of rags landed from a Cuba vessel—an operation against which he protested in vain. He had the bales "sunk in the bay, with heavy weights chained upon them. Within six days subsequent to the storage of those bales of rags on the open wharf, the fever broke out among the residents" of houses in the vicinity, and soon spread far and wide.

It is a matter worthy of notice, as going far to weaken the position assumed by Dr. Harris relative to the injurious effects of Fomites, that the statements respecting their agency in the extension of the fever in the instance under consideration are several times based on conjecture and not on matter of fact. Thus it is admitted, in reference to the case on which straw from infected vessels was stated to have acted as the agent of transmission, that "the cause and mode of such *may have been* by material fomites." Taking for granted that the most active cause of the pestilence in some parts of the water side was from the accumulation of infected materials that floated from vessels at quarantine, Dr. Harris thinks it rational to *presume* that cases of fever which occurred elsewhere received the infection from a similar cause. Again, he

yellow fever are well-founded. Judging from all I have seen or read on the subject, I can have no hesitation in stating that I feel

remarks, that persons who became victims of the fever near Coney Island are *believed* to have handled materials that floated on shore from the vessels.

It would be a remarkable circumstance that the infectious agency of fomites in the diffusion of yellow fever—admitting the correctness of the views entertained on the subject by Dr. Harris—should be so frequently noticed in the port of New York, and have been so strikingly illustrated during the summer of 1856, while such an agency has completely failed to show itself elsewhere. Let the reader refer to the writings of Burnett, Chervin, Palloni, Ralph, Joubert, Blair, King, Lefort, Ffirth, Deveze, Valentin, Miller, and many others, and he will derive ample proof of the harmlessness of the clothing, bedding, &c., of individuals who have had the yellow fever in hospitals, private houses, or infected ships. So far as regards this city and the neighboring districts, I may mention as a fact well ascertained, that no case of propagation of the fever, by the means alluded to, has been satisfactorily made out. In every instance cited, we have mere assertions or surmises, while the attack may invariably be traced to the influence of the general cause floating in the atmosphere, and affecting individuals who have not approached the sick or their clothes or bedding, or of particular sources of infection amply adequate by themselves to produce the effect in question. At every visitation of the disease, from the earliest period to the present day, the clothes, bedding, &c., of the sick have been washed in hospitals or private houses without communicating the disease—in some cases they have been used without being washed, or in any way purified, and that too on a large scale—without giving rise to unpleasant results.

It is difficult to understand how straw, clothes, bedding, mattresses, &c., which have been soaked for hours or days in sea water, can retain so large a portion of the fever poison as to impart the disease, in its most malignant form, to those who handle and use them; yet such must have been the case in many places where Dr. Harris affirms the fever was communicated by such materials. Certainly, the straw which infected the Lond Island shore or the matters which poisoned the people at Craven Point, N. J., supposing them to have proceeded from infected vessels—a fact not positively stated—must have been too well soaked and washed to retain a sufficient amount of the poison to produce the effect attributed to them. The admission of such a mode of transmission of the poison leads to that of two separate explanations of the occurrence of cases occurring at no great distance from each other along the Long Island shore, and equally exposed to the same infectious influences; in some cases the mode of access of the infection being supposed to have been by material fomites, in others, somewhat more southerly, by an atmospheric agency. The reference of the diffusion of yellow fever to the agency in question leaves unexplained the occurrence of cases in the vicinity or neighborhood of those supposed to have contracted fever through that agency, but who are not shown to have touched or approached infected materials. Where, for example, did the farm-laborer of Bergen shore, who had not been absent from the farm for a long period, contract the fever? Nothing is said of fomites in his case.

little disposition to admit with him, that the fever in the instances referred to was transmitted in the way mentioned. Without stopping to point out the objection that may be urged against the belief in such a mode of communication of the disease, I may mention that it finds no support from the results of the experience obtained elsewhere, whether in the south of Europe, in the West Indies, on the coast of Africa, in various parts of this country, and especially in this city; and is in noted conflict with a statement of Dr. Harris himself, in relation to a fact observed at the quarantine station at the time of the outbreak under consideration. "A very large amount of infected clothing from the sick, and bedding, &c., from infected vessels, were being constantly received and washed at the hospital wash-house, which must be regarded as furnishing a favorable nidus for the infection. Yet that building did not appear to be a source of general infection, as its upper rooms were nightly filled with the stevedores who were unlading vessels, and of whom none that lodged there suffered from the fever." Here we have a large amount of materials, fresh from sickly vessels, and supposed to be saturated with infectious matter, proving harmless to those washing, handling, approaching, and for what we know to the contrary, using them; while other portions of the same kind of materials giving rise to the most direful effects, after being saturated with salt-water for hours or days.

With all due deference to Dr. Harris and others who attribute so decided an agency to fomites, I cannot, after a careful survey of the numerous opposing facts collected from various sources recorded for the most part by writers entitled to our highest regard, added to what I myself have seen, withhold the expression of a strong doubt as to the correctness of the opinion he entertains, and reiterate what I said in a former publication: When we find that hundreds of sheets, blankets, and other personal effects that have been in use by the sick and dying; when we find that loads of merchandise in bales or boxes have so frequently proved innocuous, we can scarcely feel disposed to admit that the disease has been transmitted to a healthy locality by the clothes of a single individual who has labored under it, by a peddler's pack, a bunch of straw, or a box of hardware or crockery. Still less can we admit the possibility of the occurrence when such clothes have not been worn or used by the sick, and when all we know about them is that they have arrived from an infected locality in a contaminated ship or otherwise. Nor is it possible to be convinced of the reality of this agency of transmission, when the result in question has been obtained in the midst of an epidemic influence. Most of the cases cited by European

writers and by many of our own, are embraced in the latter category; while such as are said to have occurred beyond the limits of the infected localities, will not bear examination, or are so impossible as to excite our astonishment at their being adduced, in some instances by writers of respectable, and even high, standing in the profession.

But whatever may be the views entertained by Dr. Harris regarding the infectious agency of *fomites* in the diffusion of the yellow fever, those views can apply, so far as concerns the epidemic in question, to only a portion of the cases which occurred; for, as we have seen, he is disposed to regard the other cases—by far in the majority—to the cause I have advocated; the wafting of the poison by the wind from the infected vessels to the shore. In addition to what was stated before in proof of this, I may mention that in speaking of the death of General Stanton, of the United States Army, the author says: "As his mansion was situated on an elevation which looked out directly upon Gravesend Bay, and was surrounded on the north and west by a dense grove, it was presumed that the deadly infection had been wafted to his delightful residence by southerly winds, which swept over the infected shipping at Gravesend." Again, in speaking of the cases which occurred at the Redout, he remarks in terms implying acquiescence: "The history of these cases was such as to convince the intelligent and distinguished physician of the garrison at Fort Hamilton, that the infection had reached that stronghold by atmospheric agency alone." He regarded as an interesting and important fact that on Governor's Island the fever prevailed only in the immediate vicinity of the South Battery, which is nearest and most exposed to the Atlantic dock, from which the island is separated only by a narrow channel; that this battery has a southerly and easterly exposure, and faces, and was to leeward of, the quarantine anchorage, and that the officers of that command assured him that no *material* cause of infection was conveyed to or existed upon the island. Finally he expresses himself more decidedly in the following paragraph: "It will be observed that we have noted three distinct and nearly equal distant points at which yellow fever made its appearance on the Long Island shore, between Gravesend Bay and Gowanus, a distance of nearly four miles. Subsequently, viz., about the 10th of September, the fever made its appearance in one house near Partridge's mill, near Coney Island. But those who became its victims are believed to have handled materials that floated on shore from the vessels. As regards the nature and mode of the infection received at the first-named three points," Dr. Harris thinks there

can be no doubt that while at the first, near Gowanus, the cause and mode of access may have been by *material fomites*, at the two most southerly it was atmospheric.

"The atmosphere was excessively humid during the last half of July and the first half of August, and both the night and day temperature during that period rose a little higher than the average for the same period in other years. It was a noticeable fact, and even a matter of complaint in several dwellings on the Bay Ridge side terrace road, that the effluvium of the cargoes and filthy ships was smelt during some entire days before any cases of yellow fever had occurred. And we should mention here that after about the 10th of August there were no ships discharged above the Narrows. Therefore, whatever evil was inflicted, was during the six weeks preceding that date."

The circumstances preceding, attending, and following the occurrence of yellow fever after the arrival of infected ships in places heretofore free from the disease, the mode in which the latter commenced and progressed, the position of the individuals attacked as compared with that of those spared; in other words, the direction it assumed in its encroachments, illustrate too plainly the important part played by the wind in the history of such epidemical visitations to justify us in attributing the effect to any other cause. In all instances of the kind, we have the arrival of vessels infected with the poison of that malignant fever at a time when those thermometric conditions of atmosphere known to be required for the presence and diffusion of that morbific agent exist. In all we have the transmission of the latter from those vessels, coinciding with the development of the disease in individuals occupied or residing at a greater or less distance, ashore; in all we find that, similarly to what takes place where the original source of infection is located on land, the fever, in the instance in question, attacks exclusively individuals placed to leeward of the infected vessel and spares those to windward; finally, in all, we find that the residents of houses which, though in the direction of the wind, are sheltered from its action by high buildings or in any other way, escape, while in some instances the reverse of all this occurs,—vessels being infected when anchored to the leeward of an infected shore, and thereby sheltering and protecting other vessels placed on the outside of them. All this, I say, we find in the instances just recorded, and impressed as we are with the fact that the events connected with the arrival and sojourn of the brig Home at the quarantine station, are in no way unlike those which followed the arrival of infected vessels at the ports mentioned in the foregoing pages, and

that the yellow fever which had existed on board previously to her reaching the station, and was communicated to those who worked in or visited her there, made its appearance soon after her arrival among individuals who did not go aboard, attacking, however, only those situated on the leeward, and invariably sparing those on the windward side of her, we are inevitably led to the conclusion that the efficient cause of the disease was in this instance, as it was in the others recorded above, wafted ashore from the infected vessel, and there spread, through the agency of the wind.

Let not the distance to which the efficient cause of the fever is here said to have been wafted by the wind, deter the reader from lending a willing ear to this mode of transmission in the instance before us. Many facts are recorded to show that other members of the extensive family of malarial fevers may have been, and are daily carried through the same agency, to even greater distances than have been mentioned. We learn, for example, on respectable authority, that the febrile cause is at times wafted in the common atmosphere to the distance of several miles—even from Holland to England, as affirmed by Macculloch and others; of ships receiving the infection at a great distance from land—not less than three thousand feet, according to Sir Gilbert Blane; and of fevers being derived at Rochefort from the marshes of Brouage situated four or five miles off. But supposing this not to be the case, the possibility of the occurrence would be rendered evident by the well-known fact, that other substances diffused in the atmosphere, as well as some evident to the sight, and of much heavier nature than the fever poison, have been conveyed through the agency in question to a considerable distance. We are told, that soon after the outbreak of the great fire at Hamburg (May, 1842), an unusual and strong empyreumatic odor was experienced at Potsdam, at a distance of more than sixty leagues, and evidently proceeding from the direction of the burning city. The ashes of Vesuvius are sometimes wafted as far as Venice or even Greece—the distance of which from the volcano is not less than three hundred and seventy-five and five hundred and twenty-five miles. Instances are mentioned of volcanic ashes having been conveyed much farther. We learn that vessels at sea have, while sailing at the distance of six hundred and seventy-five and seven hundred and fifty miles west of the African coast, been covered with the red sand of that region. In 1812, the ashes of the volcano of St. Vincent were conveyed by the wind as far as Barbadoes. On the same occasion those ashes fell to the depth of several inches on the deck of a vessel at the distance of one hundred and eighty-one leagues

—five hundred and forty-three miles—east of St. Vincent. In 1815, the ashes of the Tamboro, in the Island of Sumbawa, were conveyed as far as Java (three hundred and twenty-four miles) in such large quantities as to obscure completely the atmosphere. The odor of burnt turf, which characterizes the exhalations of the Westphalian marshes, has, we are told, been sensibly felt as far as Brussels, Liège, and even Paris.

Philadelphia did not suffer from the fever during the preceding summer, except at the quarantine station established for its protection. Not long after the appearance of the disease there, it broke out in its legitimate form in the city itself. The occurrence cannot be said to have been unexpected to a portion, at least, of the physicians of the place; those who have made themselves familiar with the history of the yellow fever as it has, at various times, appeared amongst us, and to the members of the Board of Health—the latter of whom will remember, that some time prior to the report of the first case, one of their body stated that the advent of the disease, either in the sporadic or epidemic form, would not be to him a matter of astonishment; that this opinion was based on the fact that most, if not all, occurrences of the kind in Philadelphia—to say nothing of other places—had taken place during or after the prevalence for a period of several months of extremely hot weather—the thermometer averaging very nearly eighty degrees; that this high range during the present summer months had been preceded by a wet spring, and attended most of the time by dry weather; that from the information he had collected, there appeared to prevail, in various parts within the yellow fever zone, a disposition to the evolution of the febrile poison—an epidemic constitution of an atmosphere—and that though our wharves and neighboring streets, courts, and alleys were certainly in a better condition, in a sanitary point of view, than in former times, they were nevertheless open to grave objections in that respect. What may have been the impression made at that time on the minds of the hearers, and the measures adopted as a consequence of the opinion thus thrown out, need not be adverted to here. Suffice it to say, that the members of the Board had soon ample reason to admit that the fears expressed of impending evil were well founded; for scarcely a fortnight had elapsed before they obtained positive proof that the dreaded fever had taken a decided footing in the city, and invaded some of the very localities where it invariably showed itself in former times.

The fever did not spread as extensively as had been anticipated, and assumed not the epidemic but the sporadic form. The reader

need scarcely be told that visitations of this kind are common in all places subject to extensive manifestations of the disease. Their occurrence in such cities and towns has been noted from time immemorial—in some places annually between periods of epidemics; as well as in some localities where the fever has never or seldom assumed the epidemic form. Open we the professional records of Boston, New York, Baltimore, Charleston, Mobile, Savannah, New Orleans, Cadiz, Barcelona, the coast of Africa, the Gulf of Mexico, and everywhere the result will be found to be the same. In some places sporadic cases alone show themselves either annually or at longer or shorter intervals; in others they appear between periods of epidemic prevalence, which occur also at intervals of various duration. If we except Sir W. Pym, and a few others of the same school, physicians who are conversant with the yellow fever of the West Indies, whether they be contingent or absolute contagionists, or are opposed to that doctrine, have, from the days of Town and Desportes to our own, admitted, that the disease, such as it exists in those islands, is a native of the soil, and prevails more frequently there than anywhere else. And yet there is not one among them who does not know that the fever is not there of annual occurrence. If we open Desportes' excellent work on the diseases of St. Domingo, we shall find that in the course of the fourteen years he resided at the Cape, the place was free from the fever during five. At Martinique yellow fever did not appear from 1827 to 1838. Grenada, when visited in 1793 by the epidemic described by Chisholm, had not suffered for thirty-one years. Dominica was also exempt from 1817–1821 to 1838. Georgetown, Demerara, suffered severely in 1793; next in 1803; then in 1819. From that year to 1837 the disease did not show itself in the epidemic form. But in each of these places—free as they may be from epidemic manifestation—sporadic cases more or less frequently break out, exhibiting all the characteristic symptoms of the disease and leading to its usual fatal results.

Nor can such occurrences—longer or shorter intervals between epidemic manifestation of the disease and the annual or occasional appearance of sporadic cases during those periods of repose—prove matter of astonishment, seeing that similar events are observed in regard to other fevers to which yellow fever is closely allied. Every one knows in this country that although the bilious remittent fever, the endemic of many localities from one extremity to the other of our vast republic, appears in such places to a greater or less extent, every year at stated periods, seasons occur at which it does so in so trifling a degree as to attract little notice; and other

seasons again when it does not show itself at all. On the other hand, it is a fact placed beyond the reach of doubt, that the disease is sometimes observed to spread extensively over a large expanse of country, attacking places that had been for several, or many, years almost or completely exempt from its ravages. Such was the case in 1822, and a few succeeding years, when the disease swept over immense tracts of country, in many portions of which it had heretofore prevailed in a moderate degree, and in not a few parts in which it had not been heard of for many years before. Similar observations have been made in different parts of Europe—England, France, Spain, Italy. In the West Indies many facts might be adduced in proof. The following remarks by Dr. Imray, in relation to the fever of Dominica, will apply equally to those of other islands: "The causes of our endemic fevers reside permanently in some localities, but in certain seasons remittents and remittent fevers become prevalent throughout the island." "Though the causes from which periodic fevers originate are permanent in the country, yet do they not always operate with the same energy. Sometimes those morbific agencies remain in almost a quiescent state, and fevers occur comparatively rarely. At other times they manifest unusual activity, and then we have remittent and intermittent fever in abundance." In a word, endemic malarial fevers everywhere prevail extensively during certain seasons, while at other times in the same places, the disease, assuming the sporadic form, affects but a limited number of individuals, and surely what occurs in regard to that form of fever can easily be understood to occur in respect to the other.

The reader will not fail to find that observations kindred to those made in other countries or in different places of this country, in relation to the periods of epidemic prevalence of yellow fever, have been noted in this city on various occasions from a remote period of our professional history, at the time of year when the fever usually prevails, and under the hygrometrical and thermometrical conditions which experience teaches us are required for its production and prevalence elsewhere. Thus the fever did not appear from 1699 to 1742. It next showed itself in 1747, 1749, and 1762. From the latter year to 1793, a period of thirty-one years, there was a complete repose. The disease again showed itself in 1794, 1797, 1798, 1799, 1802, 1803, and 1805, and lastly, in 1820. From the last-mentioned year to 1853, when it again made its appearance in a mild epidemic form, the city remained free from it. But during some of these intervals the disease, not frequently but occasionally,

appeared sporadically, affecting comparatively few, but comporting itself among them much as it does under other circumstances.

That the occurrence here and elsewhere of sporadic attacks has been denied, that the disease reported on those occasions has been viewed as of a nature distinct from that of true yellow fever, and that those instances, as to the character of which there could be no doubt, have been attributed to a foreign source, are well known. But whatever may be the degree of regard to which those who entertain such sentiments are entitled, no one who has investigated the subject can for a moment doubt that on those points they err, that sporadic cases of true yellow fever do occasionally show themselves, that they have done so under circumstances which forbid the possibility of attributing them to any but home causes, and that the poison thus produced and which gives rise to them differs in nothing from that to which epidemical manifestations of the disease are due, not so much as regards the force of its deleterious action,—for it is as violent and fatal in the one form as in the other,—as regards the amount of its production and the extent of its diffusion.

As to the cause of this limited evolution of the febrile poison in some seasons as compared with its extensive generation at other times, little need be said in this place. The reader is doubtless aware that by some writers the occurrence of sporadic cases, as indeed of some epidemics, has been ascribed to the revivification, under the influence of peculiar conditions of weather, of a febrile poison which has remained latent or dormant either in the system or attached to surrounding objects from a preceding epidemic, or been deposited, as it were, in the place from the effects of some individual who, though himself unaffected by the disease, had imbibed the poison in an infected locality, or again introduced in the hold or cargo of some West India vessel. This doctrine, which met favor among several of the physicians of New York, in regard to the cases of fever that appeared there in 1800, and proved particularly acceptable to many of the European writers who have described the epidemics of the Spanish Peninsula—Sir W. Pym, Mr. Vance, Sir I. Fellowes, &c.—received the special approbation of Dr. Hosack, who went so far as to maintain that the poison might remain dormant, not *one* year only, but *two*, and break out after that period, notwithstanding the most rigid quarantine instituted to guard against its introduction. This doctrine is certainly convenient, for when contagionists and importationists are at a loss, from want of proof, to account for the appearance of the disease in any place where it has existed before, they may have recourse to the facilities afforded by it and insist on the revivification of

dormant germs. But even were we disposed to admit the possibility of the poison remaining dormant so long a time in the system or in surrounding objects, the theory cannot be applicable to many cases of sporadic development on record here and elsewhere. In some instances the fever had not been preceded for years before if at all by a disease of the kind, and could not, therefore, have been due to the development of a latent germ. In other instances the intervals were too long to justify the supposition that the germs could have thus lain dormant and resumed their virulence when again called into play; and surely, from the inadmissibility of such a theory in instances of the kind, we find reason to doubt the propriety of appealing to it in others in which the intervals are not so protracted.

The theory is objectionable on other grounds, even in its application to instances in which the disease appears sporadically or otherwise the summer following an epidemic. In reference to the fevers in New York in 1800, which, as just seen, were accounted for by this awakening of the residual fomites of the last year's epidemic, an intelligent writer remarks: "If this had been the case we should expect to find the disease reappearing in the same houses and families where it had raged last year. But on a comparison of the reports of the present year with those of the last, as far as they go, only a single instance of such reappearance in the same house is found, and this attended with circumstances which prohibit every suspicion of dormant contagion." Again, if the disease can be reproduced in this way, why is it not so more frequently? In many places such revivifications would not seem capable of being effected, at least as a general rule, for sporadic cases do not always manifest themselves during seasons following a widespread epidemic.

As to the frequency of the occurrences in question some difference of opinion has been expressed. Dr. Rush, writing in 1802, remarks, that he had seen one or more cases of yellow fever almost every year since he settled in Philadelphia, and particularly when his business was confined chiefly to that class of people "who live near the wharves and in the suburbs, and who are still the first and frequently the only victims of the disease." There may be, and probably is, some exaggeration in this statement relative to the frequency of cases of this kind, arising from the particular views entertained by the illustrious physician, who, like some others, refused to recognize a difference between genuine yellow fever and the aggravated and malignant forms of remittent bilious fever. But, after making due allowance for any error of diagnosis on the

subject, facts of undoubted authenticity will bear me out in the statement made above, of the occasional occurrence of sporadic yellow fever in this city. Let the following enumeration of manifestations of isolated cases in varying numbers, and untraceable to a foreign source, which our professional records furnish, prove the correctness of the opinion here advocated.

In this enumeration I shall not include the cases of the disease which presented themselves in 1699, for though the deaths on that early occasion did not much exceed two hundred, yet when we take into consideration the limited extent of the population at that time, the disease may truly be said to have spread, not sporadically but in the form of an epidemic, carrying off one-seventeenth part of the inhabitants. The same may be said of the visitations of the disease in 1741, 1762, 1794, 1797, 1802, and 1805, when in a population varying in those different years from twelve to fifty thousand, the mortality amounted to between two hundred and fifty and six hundred. But excluding those sickly seasons, as also 1820 and 1853, when the fever spread widely, or would, there can be no doubt, have done so had its progress not been checked, or restricted in its prevalence, by proper sanitary measures, and especially the memorable visitations of 1793 and 1798; excluding these, I say, the medical records of this city furnish us with not a few examples of the kind alluded to; in other words, of the appearance of cases of true yellow fever, which from their limited number and the small proportion they bear to the extent of the population, as well as their evident local origin, cannot be regarded in any other light than as sporadic.

Such must be the view we take of the events of 1795 and 1796. During the summer and autumn of the years 1800 and 1801, the yellow fever did not manifest itself otherwise than in the sporadic form. In the former year a few cases presented themselves in the course of July and August, though particularly towards the latter part of September. The greater number of these—not less than twenty-one—appeared in Spruce Street, between Front and Second Streets. Of this number, fourteen died. In the year following (1801), a small number of cases occurred during the months of July and September, most of which terminated fatally. Kindred events were noticed in 1803, 1804, 1806, 1807, 1808, and 1809, when the number of deaths was extremely limited in proportion to the population. As I remarked in another place: "For several years subsequent to 1805, the yellow fever disappeared as an epidemic in Philadelphia. It was met with in a few sporadic cases only during the summer and autumn of 1806, 1807, and 1809. But these cases

were few in number, and though serving to keep up the remembrance of the disease with the medical practitioners of the city, seldom attracted to any extent the notice or excited the apprehension of the public." In the same category must be placed other instances of cases which occurred at periods nearer our own. After an interval of nine years, during which the yellow fever became, as it were, a complete stranger to our city—in 1818—the disease reappeared among us, when two well-marked cases occurred and ended fatally, without the possibility of their being traced to a foreign source. The next year it broke out unexpectedly, and threatened to spread epidemically. The first case appeared on the 23d of June, on the north side of Market Street wharf, where, from that date to the 6th of July, eight cases of the most virulent character occurred. The disease then subsided, and there seemed, for a while, to be fair reasons to hope that the city would escape any further extension of the calamity during the remainder of the season. But it reappeared on the 29th of August near the southern limits of the city—Swanson Street and Huddles Alley—where, up to the 4th of October, fifteen cases occurred. Another case appeared on the 23d of September in Front, above Walnut Street. The whole number which occurred in those various localities during the season amounted to twenty-four. The disease, in all these instances, was of the most malignant kind, and proved fatal in twenty cases. The majority of medical observers denied the exotic origin of the fever, and maintained, on good ground, that it had sprung up in the localities where it appeared and prevailed; that it showed itself under circumstances preventing its being attributed to any but domestic sources of infection; that it first appeared among individuals who could not have derived it from abroad, or who had not left the city or approached a contaminated vessel or a person laboring under the disease; and that there was no vessel in port that could, with any show of plausibility, be pointed out as the instrument, direct or indirect, of its introduction.

A few years after, in 1826, a few well-marked cases, terminating fatally with black vomit and other characteristic symptoms of the disease, and exhibiting after death its usual pathological changes, were reported by competent physicians, and were witnessed by myself and others conversant with the disease. In the same category must undeniably be placed cases which occurred here in the summer and autumn of 1854. Those reported amounted to about thirty. As regards their local origin, as also that of the cases of 1826, there could be no difference of opinion, as the most diligent

search could not point out the least reason for attributing them to an exotic source. Six years after the latter sporadic outbreak, in 1860, I communicated to the Pathological Society of this city the results of the post-mortem examinations of two cases of yellow fever—one sporadic, the other imported. The first case—the only one which interests us here—occurred in the practice of Dr. A. C. Bournonville, by whom it was reported to the Board of Health. It was a truly sporadic case (the disease not showing itself in a single other instance during the entire season), and, without a possibility of doubt, it must be regarded as having been of strictly local origin. The subject of it, a German, resided in Front Street below Coates, and worked in a board yard situated at the foot of Green Street, on the Delaware front of the city. Some time previous to his attack he was employed on a raft conveying timber from the upper part of the river. He had not communicated, directly or indirectly, with any infected vessel from yellow fever ports; indeed there was no such vessel to communicate with. He had not been within many hundred miles of a yellow fever case from which he could, supposing the thing possible, have taken the disease; and he had not been in any way exposed to the supposed morbific influence of fomites, whether in the form of merchandise or clothing.

The patient was visited by several of the medical members of the Board of Health, who were perfectly conversant with the yellow fever, and from their report of the case—from the account of the symptoms, day by day, for which I am indebted to the attending physician, as also from the character of the matters ejected from the stomach and passed off by the bowels—no doubt can be entertained relative to the yellow fever nature of the disease. Indeed, could such a doubt have crossed the mind of any one during the progress of the case, it must necessarily have been dissipated by a view of the body after death, and especially by the inspection made at the City Hospital on the 11th September by Dr. Packard, in presence of Drs. Jewell, McCrea, Bell, Kane, Bournonville, and myself, of the organs, the implication of which is admitted to characterize the said disease.

Two years after, in September, 1862, the Board of Health having on the 24th of that month received a communication from the health officer, inclosing reports from Dr. Read, Mayor Henry, and others in reference to the illness and death supposed to have been caused by yellow fever, of certain parties residing at No. 108 North Wharves, the matter was referred to the Sanitary Committee for their examination and report. The Port Physician, Dr. Trenchard,

who was directed to examine the locality and inquire into the nature of the case, reported that the infected building was a large store fronting the river and extending back to Water Street, and that said store was in a very filthy condition and contained a large accumulation of decayed peanuts, potatoes, and other vegetable matter; that several persons connected with and doing business in said store had been stricken with a malignant fever, which proved to be true yellow fever, as identified by its usual characteristic and pathognomonic symptoms and post-mortem appearances; that the fever had apparently its origin in some local poison evolved in or about that building, it being impossible to trace it to an exotic source; that the number of persons there attacked and connected with the store amounted to four, three of whom, Messrs. Townsend, Taylor, and Mellor, died, while the fourth, Mr. Harris, recovered; and that a few doors above in different stores there were two other cases, Messrs. Clothier and Palmer, both of whom died, making an aggregate of six cases, all of yellow fever, five of whom proved fatal.

These individuals went through the disease and died at their respective private residences in the city or at Camden, and communicated the infection to none of their relations, friends, nurses, or physicians. The disease was strictly limited, as regards its place of origin and prevalence, to the store above mentioned and its immediate vicinity, and its career of destruction was effectually arrested by the sanitary measures adopted to cleanse, fumigate, and disinfect the premises. It remains to mention that the cases were attended by competent physicians; that some were visited by several of the medical members of the Board; that I carefully inspected the remains of two of the victims, as also the matter vomited by them, and that there could be no doubt as to the yellow fever nature of the disease.

From that day we hear nothing of yellow fever in this city, excepting of course a few cases of individuals, who, having been exposed to the infection elsewhere, have gone through the disease to death or recovery among us, till this year, when it broke out as in olden times, spread rather rapidly, and for a while threatened to assume an epidemic form. I need scarcely remark that on this, as on all former occasions, the true yellow fever nature of the first cases reported was denied. Thus, writing on the 26th of September, the editor of an influential daily paper, whose opinion was sustained by a large concourse of people, and even by some physicians, says: "Last week two deaths in this city were attributed to bilious fever and four to intermittent fever, all, of course, due

to the same cause, the presence of miasmatic poison in the atmosphere. This record alone would indicate a wide-spread prevalence of such diseases, yet we have further evidence from the testimony of many physicians that they are now extensively prevailing in all parts of the city.

"Some of these cases it is asserted have assumed an unusually severe type, and this fact has led certain people to believe that an epidemic of a more terrible disease—yellow fever—is now in our midst. The occurrences of a few cases of yellow fever at the lazaretto several weeks ago has probably started this rumor, which certainly has no foundation in the character of the cases recorded in this city. Those who have investigated all the circumstances connected with this idle rumor have not been able to find any well-authenticated cases of yellow fever within the limits of Philadelphia, nor have they been able to trace the supposed cases to any source of infection. Such rumors are freely circulated whenever intermittent and remittent fevers are uncommonly rife, and they always receive more or less credence from the over-credulous and faint-hearted."

But whatever opinion may have been entertained on the subject by some members of the profession, and more particularly by the public at large, the true diagnosis of the disease was early and clearly made out by several physicians well acquainted with its characteristic phenomena. The first well-marked case reported contracted the disease on the 8th of August and died on the 12th. The individual, Alexander Campbell, night inspector of customs, was stationed, from July 4th until he was taken ill, on board of various vessels at Point Breeze, Windmill Island, Callowhill Street wharf, and finally Shippen Street wharf. Some of those vessels were from southern ports, but in no infected condition—perfectly clean and with healthy crews. During his station at Shippen Street wharf—which it must be recollected is in the infected district—he visited several times a tavern at the corner of Davis's wharf and Swanson Street, but cannot be traced to any place where men from the brig Home had been quartered, or to any house where the yellow fever afterwards occurred. Nor can he be found to have associated or communicated with any one who recently had the disease or was in any way infected. The patient, whose attack was preceded by diarrhœa of several weeks' duration, went through the disease at his residence, No. 1739 South Street, more than a mile west of Swanson Street. The next case occurred in a small blind court opening into Krider's Alley, which runs from Swanson Street to Front, at a short distance south of Almond. Swanson Street, it

is well to remark for the information of those unacquainted with this part of the city, is the first from, and runs parallel with, the river, at the distance of a few hundred feet, and, starting from South Street and forming, as it were, the continuation of Penn Street, proceeds in a southerly direction to the end of the city. The patient so attacked (John Lyon) worked on the wharf, at a short distance from his dwelling, and, as far as can be ascertained, had had no communication with any one from the quarantine station, or in any way connected with the brig Home, or any other infected vessel. He died, under the care of a competent physician, on the 19th of August, after a few days' illness, during which he exhibited the characteristic phenomena of the fever.

In presenting this case as the first of the season reported to the Board of Health, I am not willing to be regarded as entertaining the belief that it was not preceded by others of kindred nature. Far from this, I am disposed to admit that such may have been the fact, and that cases of true yellow fever began to occur in the city before the middle of August, inasmuch as, prior to that period—so early indeed as the middle of July—deaths by *icterus*, not among infants and children only, but among persons advanced in age, after a few days' illness, were reported to the board; there is good reason to believe that the physicians who made such reports formed a wrong opinion of the nature of the disease and regarded as icterus what in truth was the fever in question; or, if aware of the true nature of the disease, made purposely, from various motives, erroneous reports to the board.

But whether this be the fact or not, to the cases above alluded to soon succeeded others of a similar kind, in most of which the disease assumed a highly malignant character, and terminated fatally. James Collins was attacked on the 27th of August and died on the 2d of September. Caroline Burmeister and Ellen Ryan were seized on the 30th of August and died on the 3d of September. The rest of the fatal cases, as well as those who recovered, occurred in September. The disease was principally rife among individuals residing, working, or otherwise doing business, in Swanson Street, below Almond, or in the neighboring courts and alleys, or who visited there, especially at night. In a few instances the infection extended northerly as far as Pine Street at the distance of four of our squares above Almond, attacking persons living in Penn Street, the continuation, as already stated, of Swanson. One or two cases were traced to Meade Alley, a small thoroughfare situated a little south of Krider's Alley, and, like it, running from Swanson to Front Streets. One individual (Robert Gorrell) went

through the disease and died at his residence in a small court opening on Seventh Street below Shippen. Another case, already mentioned, died in South Street, west of Broad; but the place of business of both was in the infected district; the former in Swanson Street near Krider's Alley, where he spent the day, while the other spent the greater part of many nights about the streets and wharves of that very locality. Other cases occurred among individuals residing more or less west of the river; but, as just said, those individuals had all worked in or about Swanson Street, or visited those portions of that street, or the neighboring wharves, courts, and alleys where the greater number of cases occurred, and which, in consequence, may justly be regarded as the focus or main seat of the infection.

This infected district was restricted within a very limited surface, extending from the river front, or rather from Swanson to Front Street, in a westerly direction, and from a short distance above Christian Street to an equal distance below Pine in the opposite direction. It comprised a portion of surface constituting the seat of all our former visitations of yellow fever; for the history of these shows not only that the disease invariably prevailed along the river front of the city and in the streets adjoining, whether running parallel to, or in a direction contrary to, the river, and seldom extended westerly beyond Front or Second Street, but that on some occasions it originated and principally prevailed in the neighborhood of the very spot where the cases of the present season mostly occurred. Thus, in 1699, the fever broke out in the vicinity of the dock, near the foot of Spruce Street, where the settlement had originally commenced, and near the river, at several points of which dwellings and stores had been erected.

In 1747 the disease originated, and was mostly confined to the southern parts of the city below the drawbridge, at a short distance from the river, in sailors' lodgings, which were then, as they are now, located in narrow, crowded, ill-ventilated, and filthy streets. It also appeared in the vicinity of the dock, which was at that time uncovered and in a miry and offensive condition. In the next epidemic, that of 1762, the original seats of the disease were the sugar-house wharf, situated below South Street and the vicinity of the new market, extending to Front and Water Streets. Even more evident was its origin about or near the wharves in 1793, when the early cases occurred in Water Street, and for some time were almost invariably traced to that locality. In 1794 the disease again made its appearance in the usual localities—prevailing in Water Street between Market and Walnut, and extending westwardly in various

directions. Three years after it began at the water side—about Pine Street wharf, in Water Street, and also in the then districts of Southwark and Kensington, where its ravages were chiefly confined. During the formidable epidemic of 1798 the principal seat of the disease was, as on most other occasions, the river side and the adjoining streets, beginning about Spruce and Water Streets. In 1799 it appeared in Penn Street and principally affected the wharves between Pine and Lombard Streets, near the southern boundaries of the city, and the district of Southwark in the vicinity of the old Swedish Church, which is situated in Swanson Street below Christian.

In 1803 the first location of the disease was about Chestnut and Water Streets. It then appeared in Water and Sassafras, and next in the lower part of the city, near South—the principal focus of the infection extending from Market to Walnut Streets, and from the east side of Front to the Delaware. Two years after, the disease broke out in the district of Southwark, about midway between the new market and the Swedish Church—reaching subsequently to Front near Spruce streets. The principal focus, however, of the infection was circumscribed within the limits of Southwark. Epidemically it did not extend beyond Second Street in the city and Fourth Street in Southwark. We have seen that in 1819 the disease first appeared on the north side of Market Street wharf, and after a subsidence of a few weeks reappeared near the southern limits of the city—Swanson Street and Huddle's Alley. In 1820 the fever broke out in Water Street, near Race or Sassafras. Next it appeared about Walnut Street wharf, in Water Street between Market and Mulberry, in Front between Walnut and Chestnut, in Letitia Court, running south from Market, between Front and Second, and in Second Street near Shippen—the first street south of the city boundaries. With the few exceptions just mentioned, the disease did not extend to the westward of Front Street, all the cases being traced to the space included between that street and the river, though principally to the wharves, to Water Street, and to adjoining courts and alleys. In 1853 the first cases of the fever appeared about South Street wharf. From this point the infection extended north, south, and west, and covered a space measuring some 600 yards in one direction and 200 in another, and bounded north by Union Street, south by Queen Street, west by Second Street, and east by the Delaware River. Finally, as already seen, the cases which occurred in the seasons not included in the preceding enumeration, embracing those which occurred after 1853, appeared about the wharves or adjoining streets. In a word, the

fever in every instance mentioned, whether appearing sporadically or assuming the form of an epidemic, has broken out and prevailed in some portions of a strip of the city fronting the Delaware River and extending north to south from Vine to Christian, and westward from that stream to Second; within which strip lies the locality—nay, the very streets and neighboring courts and alleys—visited by the fever during the past sickly season.

As regards the condition, considered in a sanitary point of view, of the localities thus invaded by the fever, it will be sufficient to state that, though it compares somewhat advantageously with that of the area subject to the same disease at former periods, those localities have not been sufficiently improved to remove from them the power of evolving effluvia injurious to health, and among these the poison giving rise to the disease under consideration. If in times past the fever broke out principally in narrow, damp, close-crowded, ill-ventilated, and filthy streets, courts, and alleys; about equally filthy docks, and along crowded wharves; and prevailed in a great measure in small tenements filled to overflowing with a reckless, improvident, and intemperate population; so this year, while the wharves are, from having been paved, in a less objectionable condition, and the large streets in the middle are comparatively cleaner than formerly, the courts, and alleys, and the gutters everywhere were at the outbreak of the fever in a most filthy state, devoid of everything like proper paving, filled with decomposing rubbish and animal and vegetable refuse from which issued, in various spots, an insufferable stench, and the fever, with few exceptions, spent its force on the residents of small, crowded houses situated in such localities and built for the most part in contravention of sound principles of the science of hygiene.

In the city of Philadelphia the connection between high atmospherical temperature and the prevalence of yellow fever, whether in the epidemic or sporadic form, has always been found to hold good. It was early pointed out, and has been noticed in all the outbreaks of the disease that have occurred here from 1699 to the present year. Our summer climate approximates closely to that of the tropics, and our records show that on no occasion has the disease prevailed where the mean temperature of the warm months has remained below the standard of those regions. The late Prof. Caldwell, who seems to have been the first on this side of the Atlantic to call attention to this fact, shows, from observations kept during several years, from 1796 to 1806 inclusive, that the yellow fever did not make its appearance unless the mean temperature of the summer months reached 80° and remained forty days

or upwards. Since his publication a more extended series of observations made by Mr. Cadwallader Evans, from 1793 to 1817 inclusive, have shown that the fever during that long period of twenty-four years, never prevailed "at all, or so as to create alarm when the mean heat" at 3 P.M., of all June and July, had been lower than 79°. The exception to this was in 1802, when the thermometer indicated a mean of 78°.

Turn we now to the hygrometrical condition of the atmosphere and soil as an influencing agent in the production of yellow fever, and our professional records will show that the disease, as it has prevailed in this city, has been connected, in most instances at least, with a deficiency of atmospheric and terrestrial humidity; though in all instances of its occurrence it will be found that prior to the accession of dry weather, the earth had been more or less saturated by heavy or long-continued falls of rain. But whatever may have been the degree of such a saturation, it soon subsided under the desiccating agency of a heat truly tropical, and not a long time elapsed before the humidity resulting from the evaporation disappeared almost completely. The visitation of the disease this year, limited as it is in the extent of its prevalence, formed no exception to the rule above mentioned. During June and July, and the early part of August, the thermometer ranged as high as the degree referred to by Caldwell and Evans as being essential to the existence of the fever. Thus, according to observations made at the Pennsylvania Hospital, the mean temperature of June, July, and August was 77°.21; 80°.61 and 75.°82, with a maximum of 95°.50; 97° and 95°; and a minimum of 61°; 61° and 61°—the range being 34°.50, 36°, and 31°; while the mean heat during each of those three months, at 3 o'clock in the afternoon, as recorded at the Merchants' Exchange, was 83°.60; 86°.64 and 85°.19. During the same time the heat was attended, after a wet spring, with a drought of long duration, the effect of which was an unusual desiccation of the soil.

The reader is doubtless aware that, like the epidemical manifestations of the fever, the sporadic cases which have, as seen, occurred in this city, were invariably ascribed by some professional men and almost universally by the public at large, to an exotic source; in other words, to importation from abroad, through individuals laboring already under the disease, or sickening after their arrival, or through infected ships, merchandise or personal effects, etc. But on investigation it will be found that the authenticity or the probability of the occurrences referred to upon which these explanations are founded, has never been sufficiently made out to render them entitled to entire confidence; while even were it otherwise, it

is more than doubtful whether they could have exercised the influential morbific agency attributed to them. Thus, in one of the early visitations the disease is said to have been imported in a ship (or other sea vessel) from Barbadoes, "whose cargo consisted of cotton in bags, which were landed at a wharf between Market Street and the draw-bridge, and there stored for sale." The particular ship, however, was never pointed out, and the information is derived from a layman, whose father obtained it at the time of the calamity, when he was only fifteen years of age. On another occasion the fever was referred to a foreign source; but the advocates of this opinion differed as to the place whence it was to be traced, and the mode of its introduction. In 1747 the disease, as we are told, was brought in a vessel from *some part* of the West Indies, and was communicated by the clothing contained in the chest of a person who died of it in the West Indies. The fever of 1799, which commenced in July, was thought to have been imported in a vessel which arrived on the 14th of May; that of 1803 was said to have been introduced through means of a packet-boat from New York, "because," says Dr. Rush, "a man had sickened and died in the neighborhood of the wharf where this packet was moored."

It is unnecessary to enter fully on this subject. From a review of the circumstances under which these sporadic attacks of yellow fever occur, it must be seen that those who refuse to attribute them to importation, and refer them to the operation of local or domestic causes on systems peculiarly predisposed, cannot be far from the truth. In several instances they were evidently traced to such causes, and in none could they be successfully referred to importation from distant places. This was certainly the case in 1801, 1818, 1819, 1826, and 1854, when the most persevering contagionists and importationists could not find the smallest chance of deriving the disease from abroad. No less true is it that the cases mentioned as having occurred in 1860 and 1862 afford no support to those who may feel disposed to advocate that opinion. Undeterred, nevertheless, by the ill success of their predecessors, and finding it easier and, as they think, more natural to attribute the development of the fever of the present year to importation from abroad than to look at home for the evolvement of its efficient cause—refusing to recognize the existence in any part of the city of the materials required for the elaboration of the infecting effluvia—some of our physicians and the mass of the population have attributed this last visitation to the introduction among us of contagious germs, derived from the bodies or personal effects of individuals connected with the brig Home, and who arrived while already laboring under the dis-

ease, or sickened soon after. This opinion, however, is open to strong objections.

If the disease was due to contagious or infectious germs deposited in the city by individuals who had taken it at the quarantine station or on the brig Home, it should have broken out within a short time after their arrival here, inasmuch as the process of incubation, as a general rule, is of short duration; again, the persons sickening here with the fever must, if infected in that way, have communicated with those from whom they are supposed to have derived the disease, by living in the same house or room, by nursing or visiting them. Besides this the disease, supposed to have been so derived, must have manifested elsewhere than where it first made its appearance, contagious properties; or their personal effects must have possessed infectious powers. Now let it be recollected that the first well-authenticated case died on the 19th of August, after only a few days' illness. The second was attacked on the 27th of August, and terminated fatally on the 2d of September. It is true, as already stated, that a case reported as affected with icterus, but which may have been yellow fever, died on the 14th of August, and another on the 18th. But even the latter cases would have occurred rather late to justify the belief that they had been infected by the sick from the quarantine station; for the pilot, Stephen Bennet, who left the Home on the 30th of June, sickened in the city on the 2d of July, and died after five days' illness, *i. e.*, seven days before the earliest supposed case, and twelve before the first well-authenticated one. George Griffith, second mate of the Home, was attacked in Philadelphia on the 3d July, and died on the 6th. Now, while the earliest cases in the city were attacked too late after the early cases from the Home, to have taken the infection from these, the other individuals who derived the poison from that source sickened and recovered or died here, and did so sometime *after* the disease had already existed among us, and could not therefore have been the instruments of communication.

Admitting, however, for the sake of argument, that such might have been the mode of transmission of the fever from the brig Home, while she lay at the quarantine station, or from the infected grounds or buildings of that locality, to the city; admitting that the disease, as it appeared here, did not originate from the operation of local causes of infection, but was the offspring of importation through the instrumentality of patients from below, we are met by the fact difficult to explain in accordance with that hypothesis, and for the knowledge of which I am indebted to my friend Dr. Goodman, the port physician, who investigated the subject, *i. e.*,

that none of the individuals who harbored, boarded with, nursed, or visited the sick in question (whatever may have been the crowded state and filthy condition of the houses where this took place), took the fever; while none of those who were attacked, at any period of the season, had either nursed or visited or had anything to do with the sick from the vessel or the station here or elsewhere. And yet, supposing the opinion correct, the former ought to have been the first victims of the disease and not persons living at a more or less considerable distance; while those affected ought to have approached somehow or other the sick from whom they are believed to have derived the infection.

As we have seen, Stephen Bennett, the pilot of the Home, sickened and died in Philadelphia in a crowded tavern, and yet no one in the house took the disease. The second mate, George Griffiths, who absconded from the station, died in Norfolk Street; William Hess went through the disease in Tasker Street; Mr. Harrison died in O'Neil Street, Kensington, and Mrs. Riddle had the disease and recovered in West Philadelphia; but in none of these instances was the fever communicated to those around the patients. The same may be said of the cases of the carpenter, Charles Hancock, and of the sailor, Olivier Pierre, who, before being sent to the Municipal Hospital, were ill some days in the city, the former in Mercer Street, and the other successively in two crowded taverns situated in the lower parts of the city; but in neither of these places, nor in the hospital, did they communicate the fever. To this let me add that none of the individuals who removed from the station to the city, and who might be supposed to carry along with them the contagious germs of the disease, communicated the latter to their friends or visitors. Such was the case with Mrs. Mason, the washerwoman of the place, and such was the case also with persons —physicians, members of the Board of Health, etc., who visited the station for business or other purposes during the prevalence of the disease, and returned home after a stay of longer or shorter duration without endangering any one with whom they associated.*

* In opposition to this statement as to the absence of communication of the fever by the sick from the lazaretto to persons in the city, it has been mentioned on the authority of the physician who attended William Hess, that his wife and mother, who were with him during his illness, "had a fever of a few days' duration," and that that fever was similar to one with which he had labored, *i. e.*, yellow fever. We may, however, reasonably doubt the correctness of such a diagnosis when we learn that this physician acknowledges that the fever in both cases was of a mild type, and that, under other circumstances—had not Hess

Nor is it less certain that the mode of origin of the fever in the city, contended for by importationists, cannot be regarded as the true one unless we are prepared, laying aside all difficulties arising from the absence of personal communication between the sick from the ship and individuals subsequently affected, to admit that the disease possessed and manifested, on the present occasion, strong contagious properties, or that their personal effects—clothing, etc. —could have conveyed the infection. But the results of careful observation and extensive inquiry prove that whatever may have been the case elsewhere and at other times, the yellow fever which occurred in this city during the past season, did not manifest any more than did that which prevailed at the quarantine station—whether among the cases traced directly to the Home or those that broke out on shore among individuals who had not gone abroad—the least disposition to spread by personal contagion. Nowhere did those who, having imbibed the seeds of the disease in the infected district, sickened and went through its different stages in other parts of the city, and there, or at the Municipal Hospital, recovered or died—some undergoing a post-mortem examination—communicate the fever to relatives, friends, nurses, and attendants. Nowhere did their clothing or other personal effects, sheets, coverlids, mattresses, pillows, prove the instruments of communication; and assuredly no one can greatly err in refusing to believe, that a disease that cannot be carried from an infected district to other parts of the city, or into the wards of an hospital, either by the sick or by personal effects, should nevertheless be sufficiently communicable as to have contaminated that same district and planted therein the seeds of the febrile poison through the agency of a few patients and a small quantity of such effects.

Neither can it be said that the infection was conveyed to the city by the Home at the time of her being sent up the river through the mistake of the lazaretto officials; for this took place, as must be remembered, on the 4th of August, and consequently but four days before the occurrence of the first reported case, and which would allow a rather short period for the process of incubation, supposing the individual so poisoned to have gone on board or approached near the vessel, soon enough, if at all, after she reached her anchorage to justify the belief, which there is every reason

been at the lazaretto and labored under the yellow fever—he would have said that both women had suffered from a slight remittent—a form of disease, let it be remembered, which prevailed at the time in the neighborhood of their residence.

to conclude was not the case. To this let me add, that the removal of the Home took place *after* the occurrence of the cases of the fever which, as I have suggested, were erroneously reported under the title of icterus. It must be borne in mind, too, that the Home was absent from the lazaretto little over thirty hours; that she had been carefully cleansed, fumigated, and white-washed; that during the time she remained up she never approached a city wharf; that no one from the city—no one, at least, who afterward suffered from the fever—went on board; that she was never nearer than from 800 to 1000 yards of the infected district; that she lay to the leeward of that place, and that had she been infected to such a degree as to affect so rapidly individuals located at such a distance, and spared those who brought her up and took her back, the conclusion to be drawn is, that the fever was this season, as it was on former occasions, of local origin. Much to the gratification of all, and no little to our surprise—considering the circumstances under the influence of which it arose—the visitation was of short duration, not exceeding a month, the first case having, as already stated, been attacked on the 8th of August, and ended fatally on the 12th; and the last reported having commenced on the 8th of September, and closed in death on the 11th. During this sickly period of thirty-one days, which terminated without the occurrence of any of those atmospherical influences which usually arrest the further progress of the disease, and apparently from the mere cessation of the elaborative process giving rise to the fever poison, the number of cases reported to or coming under the cognizance of the Board of Health, owing to their having died in the city or at the Municipal Hospital and been necessarily reported, or to their having been sent to that establishment and there recovered, amounted, exclusive of all who had imbibed the poison on the Home or at the quarantine station, to seventeen. Of these, thirteen died. These numbers, however, do not in all probability represent the whole amount of deaths from the disease, and especially of the cases which occurred during the course of the season. Thus, to the number of deaths mentioned under the head of yellow fever may, I have no doubt, be added those already alluded to as having been reported as resulting from icterus, inasmuch as deaths from that disease in adults, after an illness of a very few days, especially succeeding each other at short intervals, are not events of usual occurrence. It must be recollected, too, that some of those cases were reported but a short time prior to the appearance of undoubted instances of yellow fever, and others about the very time when that disease was avowedly prevailing, *i. e.*, the latter part of August and beginning of

September, and in the portion of the city justly regarded as the infected district.

With this before us, there can be but little danger of error in regarding those deaths as having really resulted from yellow fever. The correctness of this opinion is rendered the more probable from the fact that, on more occasions than one, not only during the past season but in former days, fatal issues from yellow fever have been officially reported as having resulted from other and very different diseases. One, in regard to the nature of which there could not be the least difference of opinion among competent physicians, was, this very season, represented by the medical attendant, as having resulted from debility; another, equally well authenticated, from cholera morbus; another, again, from congestive fever; a fourth from malignant bilious fever; while the records of the Board show that in former years deaths from true yellow fever have been reported under the head of various diseases—not unfrequently under that of jaundice.

If such was the case in those instances; if during this season erroneous certificates of the kind mentioned could be handed in to the Board; and if in former days physicians could attribute to jaundice deaths which really resulted from yellow fever, we can easily understand how the physicians who attended the cases reported as having died of jaundice—young for the most part in the profession, doubtful graduates of some foreign, perhaps problematical, school, and surely unacquainted with the characteristic phenomena of yellow fever, particularly impressed with the appearance of the skin and eyes, and overlooking other symptoms necessary to a correct diagnosis, and which would not have escaped the attention of more experienced observers—can have mistaken the true nature of the disease, and given it, in their certificates, the names which from the coloration of those parts seemed to them to be most appropriate. It may also be that, though perfectly aware they had had to deal with the true fever, their certificates, as well as those of the other physicians alluded to, were purposely worded in the way mentioned with a view to avoid alarming the public, to whom the words "yellow fever" invariably conveys to the mind the idea of impending destruction.

Supposing this conjecture to be correct, it would follow that the mortality from the fever amounted not to thirteen, but to seventeen, and that the number of cases reported under the true or some other name may be set down at twenty-one. This, however, cannot include *all* the cases of the disease which occurred during the season; for while we may arrive at some knowledge—if not precise, at

least nearly so—respecting the extent of the mortality from it, inasmuch as nobody can be buried without a certificate from the attending physician, or some other responsible person, stating the nature of the disease causing the death of the individual, it is almost impossible to ascertain with any chance of success the exact number who have suffered from any disease, in its various forms or grades. To this the yellow fever forms no exception; for we have every reason to believe that, besides the nineteen cases referred to above, several, perhaps many more, occurred and recovered, which from the mildness of the symptoms, from ignorance on the part of the attending physician, or other causes, or for sundry reasons unnecessary to be mentioned, were mistaken for something else and passed over in silence, or purposely misrepresented under some fictitious name.

From all that precedes we may, I think, draw the following conclusions:—

1. The efficient cause of the yellow fever was brought to the lazaretto station below the city of Philadelphia, in the brig Home, recently arrived from one of the West India islands.

2. The presence of the poison on board is proved by the occurrence during the passage of two cases, one of which (the captain) proved fatal, while the other (the cook) ended in recovery.

3. The seeds of the disease were also communicated to two other individuals, one of whom was on board during the whole passage (the second-mate), and the other from the mouth of the river to the station (the pilot). Both of these individuals sickened after they had landed, and died in the city.

4. The disease was communicated *after* the arrival of the vessel to persons who visited her or worked on board.

5. The same result attended in individuals who simply approached, worked, or resided in the vicinity of the vessel and abstained from going aboard.

6. The poisonous agent was wafted to the shore and affected individuals residing, working, or visiting at a considerable distance from the river front and on the leeward side of the infected vessel.

7. The disease was not communicated ashore, and did not spread there through means of a contagious virus emanating from the bodies of the sick, or from their personal effects impregnated with that virus, or of the same virus adhering to the persons of such of the crew or passengers as associated with individuals at or near the station or elsewhere, but of a poison either received on board,

at the place of departure, mixed up in the atmosphere, and there inclosed during the passage, or generated in her hold.

8. About the time of the outbreak of the fever at and near the lazaretto station, the fever made its appearance in a restricted portion of the section of the city where it usually prevailed in former sickly seasons, and during the prevalence of thermometrical and hygrometrical conditions of atmosphere, similar to those usual in such seasons.

9 On this, as on all former sporadic and epidemic occurrences of the disease, the latter arose not from the importation of the sick or of their effects, or from the arrival of individuals carrying about their persons or clothing the germs of the febrile poison from the lazaretto or elsewhere, or from emanations issuing from an infected vessel, but through the agency of infectious effluvia generated in the city itself.

10. The narrative of the events of the last sickly season establishes the fact that the fever, as it showed itself on that occasion, differed in nothing from that which prevailed sporadically or epidemically in the city in former times, either in regard to the source of its origin or the mode of its progression; and it lends support to the opinion of those who hold that the yellow fever in its manifestations among us, and in other places protected by efficient quarantine establishments or the peculiarity of their position from the introduction of foreign sources of infection, cannot, owing to the absence of facts pointing to the existence of such exotic agents of communication, to its occurrence in instances in which it can be traced to a visible source of infection, to its being put a stop to by the destruction of that morbific agent, to its continuance till arrested by proper means of purification, or in epidemic times by the advent of frost, as well as to the possibility of tracing the cases that occur to exposure to ostensible sources of infection; these events, I say, prove that the disease cannot be viewed otherwise than as a preventable disease due to the morbific action of an efficient cause generated on the spot: thus, it will be perceived, disproving, as does, indeed, the history of our former epidemic and sporadic outbreaks, the opinion of those who maintain that the yellow fever of middle latitudes is never due to such causes, but is the offspring of a poison derived from tropical regions, and who think it is barely possible that the disease has sometimes originated solely from local causes, at points as far north as the ports of North Carolina.

11. At no period of its duration, and in no situation where the patients went through its various stages to recovery or death, did

the disease manifest in the least degree its being endowed with the power of spreading by personal contagion, no one being seized who resided elsewhere than in the infected district or who were not exposed there, especially at night, and no one of the sick communicating it to their relations, friends, physicians, or attendants, either in private houses where they were received, and many of which were crowded and filthy, or in the wards of the Municipal Hospital.

12. Finally, the same narrative serves to confirm the opinion long entertained, that while in localities such as those above referred to, the fever is the offspring of local causes and in no way due to the agency of an exotic poison, cases present themselves in places unprovided with the means of protection mentioned, in which its efficient cause has, without the possibility of doubt, been introduced in an infected ship or steamer, as illustrated by the history of the Home and other vessels referred to in these pages. But in such visitations, the fever never assumes the epidemic form, and ceases to prevail, as it would do in any other place in which the poison had been accidentally allowed to penetrate, on the removal or perfect purification of the tainted vessel, allowance being made for the length of the period of incubation in those who had imbibed the seeds of the infection contained on board prior to the adoption of such measures, and it may, therefore, with strict justice be regarded as having been *imported*, and thereby as establishing its claim to the appellation of a portable disease.

I here close what I had to say on the main subject of this communication.

In once more calling the attention of professional and other readers, while describing the history of the late outbreak of yellow fever in this city, and especially at the lazaretto, to views respecting the origin and mode of progression of that formidable disease, which I long ago, and after extensive investigation, adopted, and several times defended, and the correctness of which I have never found the most distant reason to doubt, I am not unmindful of the fact that I expose myself to the criticism and severe censure, on more points than one, of some medical readers and of a larger number of those members of the community who honor these pages with a perusal. With the latter, as well indeed as with some of the former, the doctrine of local origin and non-contagion has always been, for many reasons, unpopular. Not the least influential of those reasons is that, in their opinion, it is wounding to the pride of every true lover of his native place or of his adopted residence, to be told, and to be forced to acknowledge, that he possesses near

him materials which, by their decomposition under the influence of certain thermometrical and hygrometrical conditions of atmosphere, produce the poison giving rise to the form of fever in question; while they find it easier and less offensive to their feelings to attribute its dissemination to the effect of personal contagion than to the action of the air polluted through the agency of emanations issuing from home sources of infection.

It may be mentioned here, as a circumstance worthy of notice, that the advocates of importation, and, as an almost necessary consequence, of personal contagion, appear to be more numerous now than they were formerly, not in this city only, but in other parts of the country also. Forty or fifty years ago, opinion relative to the subject was far from being as general among people at large as it is at present, while among physicians, importationists and contagionists, constituted but a small minority. Such was certainly the case in this city; for when, in 1822, two years after the last epidemic of the fever, which had served to open the eyes of the practitioners of the day respecting its origin and mode of progression, Dr. Chervin, who visited this country to collect, as he had done elsewhere, documents on the subject, could secure here —where, at the beginning of the century, contagionists greatly abounded—but a very few physicians advocating that doctrine. A more ample knowledge of the disease and a more accurate investigation of the question at issue had taught the practitioners of the day the propriety of a change of opinion; of the necessity of looking to home causes to account for the origin of the fever, and of discarding the idea that it spread by personal contagion. At present it may, without fear of error, be said that the reverse of this statement holds good among us; and, I presume that, in other parts of the country, a counter change of sentiment among physicians has also gradually taken place, and that the majority of them are importationists and contagionists. In acknowledging this, however, I have no hesitation in saying that the result is due, at least in the majority of cases, not to a more extended and accurate investigation of the subject on the part of our contemporaries than had been paid to it formerly, and to a more enlarged experience in the disease, but to the very reverse cause—deficiency of investigation and experience. Nor can this be a matter of surprise, so far at least as the state of opinion among the physicians of this city is concerned, when we bear in mind that the fever had not for many years, till the present, appeared among us to such an extent, in such a way, and under such circumstances, as to attract attention and create alarm. Experience all over the yellow fever zone

teaches, that the more frequently the disease prevails epidemically anywhere, and the more repeatedly, as a consequence, opportunities for ascertaining its nature, causes, origin, and mode of dissemination are afforded to physicians, the more the advocates of importation and contagion lessen in number and make way for others entertaining opposite views; while, on the contrary, in proportion as those opportunities cease to present themselves, different results occur—the supporters of that doctrine multiply, and regain possession of the field by the death or retirement of the old and experienced, and the advent of a new set of physicians unacquainted, from personal observation, with the disease, and who not possessing leisure to study, by a careful and extended reference to the writings of reliable and well-informed authors, all the phases of a febrile complaint they feel little interest in, and which they have no expectation of encountering; and, indeed, as is not unfrequently the case, having no taste for investigations of the kind, insensibly glide into the views of the people by whom they are surrounded, and adopt the doctrine most easy to comprehend, and to fathom the details of which requires, as already said, neither comparison nor reason. In a word, in the former instance the advocates of importation and contagion gradually disappear; in the other, their numbers increase, and their favorite doctrine regains the ascendency.

But whatever be the cause, each individual defends his own place of residence as though its character and value were involved in the decision, as well as his own sagacity and penetration in having made such a choice. Hence, we find that medical men—and clever ones too—though having no pecuniary interest in the matter, exert themselves to show that the fever of one spot has originated in another; when by others, on the other hand, its birthplace is, or might be, with equal propriety, referred elsewhere. The tendency is nearly universal, and prevails among us, as it does everywhere else within the yellow fever zone. All feel ready, often without due examination or reflection, to reject as unfounded, and even as offensive, every statement of facts going to show that the fever when it breaks out near them has not originated somewhere else, that it has not been imported, and has not been propagated by personal contagion. This disposition to throw the blame on others is not of recent date. Dr. Rush, referring to the subject, many years ago, properly remarked that the idea of always attributing the advent of the fever to an exotic source not only accords with the indolence of the advocate of that doctrine, but moreover flatters avarice and pride by throwing the origin of a mortal disease from his pro-

perty and country. "The principle," he continues, "of referring the origin of the evils of life from ourselves to others is universal. It began in Paradise, and has ever since been an essential feature in the character of our species." Nor did it escape the attention of Humboldt. "In all climates," says the great traveller and philosopher, "men imagine they find some consolation in the idea that a disease reputed pestilential is of foreign origin. As malignant fevers are easily engendered amid a large crew, heaped up in filthy vessels, the commencement of an epidemic dates pretty often from the arrival of a squadron. Then, instead of attributing the evil to the vitiated air contained in vessels deprived of ventilation, or to the effect of a hot and unhealthy climate or newly arrived sailors, people affirm that it has been imported from a neighboring port, where the vessels have touched on the passage from Europe to America. It is thus that we often hear it said in Mexico that the vessel-of-war in which such and such a viceroy has arrived into Vera Cruz has introduced yellow fever, which had ceased to reign for some years past; it is thus that, during the hot season, the Havana, Vera Cruz, and the ports of the United States, mutually accuse each other of being the source of the disease by which they are visited." "In the West Indies many—indeed I may say all colonists, as Dr. Ferguson remarks—will strive to remove the reproach of pestilence from their shores. They will greedily imbibe the grossest delusions—swallow and propagate the idlest tales of importation, and shut their eyes to the most obvious facts of native origin for as long as they can make the favorite belief subservient to the character and interest of the colony, consequently to their own."

One island receives it from another, or from some other part of the world: St. Vincent gets it from Guadeloupe; St. Christopher from Grenada; Tobago from Trinidad; Demerara and Santa Cruz from Barbadoes; Cayenne from Para. Martinique, in the origin, thought she owed it to Siam—hence the name it went by—*Mal de Siam*. At another time it was traced in the same island to Marseilles, where it had been brought in bales of cotton, taken out of a vessel recently arrived from Egypt. Again, Martinique, as well as St. Domingo, Havana, and other parts of the West Indies, were supposed to have received it from Philadelphia. Barbadoes, where the disease was known under the name of Kendal fever, was once regarded as deriving it from Pernambuco; St. Domingo from Martinique; Santa Cruz from St. Domingo; Jamaica and Guayaquil from Panama; Grenada from Bulam. Again, the epidemic of Rio Janeiro, in 1850–1, was at first attributed to importation at Bahia, by vessels from Baltimore,

or New Orleans, or Canada, and thence by contagion to the first-mentioned city. Subsequently the agency of vessels from Africa was called into requisition. The epidemic of Cadiz, in 1800, was traced to the city of Charleston; while Seville, Xeres, Malaga, and Carthagena received it from Cadiz, or from one another. The fever of Cadiz, in 1819, was thought to have come from Calcutta. The fever of Charleston is often said to be imported from the West Indies. St. Augustine (Florida), Augusta, Savannah, and other Southern cities receive it from distant points. New Orleans is, in the minds of some of her sons, washed from the stain of giving rise to the yellow fever, which is attributed to intercourse with Havana, or Africa, or Rio Janeiro, or Vera Cruz, or some American port. Vera Cruz, in turn, accuses New Orleans, or some other infected spot in the United States, or elsewhere.

It is usually admitted that the greater part, if not the whole of the western coast of Africa, is prolific of febrile diseases, which at times assumes the character of true yellow fever. But many of the stations have found defenders. By one it is discovered, that with the exception of Sierra Leone, none of these stations are chargeable with the offence of giving origin to the fever, and that whenever it has broken out in any place, except the former, its appearance has invariably been preceded, within a very short time, by the arrival of vessels having the disease on board, and by the actual disembarkation of the sick While, however, such is the view taken on this subject by some authorities, others have advanced the opinion that the fever of Sierra Leone in 1829—a place which, as Dr. Johnson says, and, as would be inferred if the preceding statement be correct, ought to be the last in the world to accuse others of being the source of contamination—was thought, by some, to have been imported from Fernando Po, and by others from the Mediterranean. The fever of Ascension, in 1823, was attributed to importation in the ship Bann, which itself had received it from another ship at Sierra Leone; and mention has already been made of the introduction of the fever into Boa Vista, in 1845, and of the manner in which it comported itself in that ill-fated island. May not the following exclamation by Dr. Ferguson, relative to occurrences in the West Indies, apply with equal force to every other place where yellow fever has prevailed? "What a spectacle! what a treat to the cynic, to behold the circle of West Indian communities all generating yellow fever during certain unhealthy seasons, yet unable or unwilling to perceive that poison springs from beneath their feet, denouncing one another as the importers!"

The reader will perceive that should these recriminations, these

mutual accusations, these shiftings of responsibility as regards the origin of the evils resulting from the fever, be well founded; should it be true that, prevail where it may, the fever has not been generated there from the morbific action of local sources of infection, and that the efficient cause of those evils must, as believed by a large portion of the public and not a few members of the medical profession, be looked for anywhere but at home; it must follow, that the disease in question, though belonging to the class of malarial complaints, and consequently, strictly speaking, of an infectious, local, and non-contagious nature, and therefore distinct from those denominated meteoric and due to secret qualities of the air, has in reality no special birthplace, cannot be traced to any acknowledged starting-point, and belongs to no distinct region of country, being, as it would seem, generated nowhere in particular, and invariably derived from some place or locality different, and more or less distant, from the one where it happens to prevail.

Neither can it have escaped the attention of the reader, after what precedes, that in their endeavors to wipe their place of nativity or residence from the stain of giving birth to the disease, importationists have, not unfrequently, from ignorance of its true habitat and real mode of progression, or from other causes, derived it from places where it never prevailed, or where it had not done so for many years back; or, at any rate, where, for certain, it did not exist at the time of the event described. Siam, India, and Egypt have never, to my knowledge, been visited with the yellow fever; and when, a good many years ago, Rio Janeiro was accused of having furnished it to European, West Indian, and United States ports, the fever was not only not prevailing in that city at the time, but did not do so till 1850–1; and on examination it will be found that neither there nor in any of the other harbors or cities of Brazil had it prevailed, except sporadically, and that very seldom, too, for nearly a century past.

Nor are the opponents of the local origin and strictly infectious, in contradistinction to contagious, character of the disease—whether connected or not with the medical profession—always felicitous as regards the nature and probable accuracy of the statements they adduce in proof of the correctness of their views. Of the truth of this, the medical literatures of Europe and this country—the former, it is but justice to state, more particularly—furnish many examples, which, to philosophical and well-stored minds, must appear as savoring of romance, and cannot bear the test of serious examination. But, tempting as the task of describing them, and thus exposing the worthlessness of the extraordinary and idle tales we are so

often treated with by those who strive to make good the theory in question, doubtless is, the subject would, if entered into at large, occupy more space than can be spared on the present occasion. Let the following cases suffice: As the reader will recollect, Dr. Chisholm, the great apostle of importation and contagion, and the standard authority of the advocates of that doctrine, maintained that the fever of Grenada, in 1793, was introduced there by the Hankey on her arrival from the island of Bulam, and thence carried by contagion to other parts of the world. He admitted (1) that the yellow fever did not prevail on the coast of Africa at the time of departure of the ship; (2) that the disease from which her crew and passengers suffered so severely was the common endemic malarial fever of the country; (3) that this fever was devoid of contagious property; (4) and that the Hankey could not, therefore, have derived there the disease she carried into Grenada. In view of these admissions other etiologists and pathologists might well feel puzzled to connect as cause and effect the Hankey with the epidemic which followed her arrival at the ill-fated island; but according to Chisholm the event found an easy explanation, which may be thus epitomized. The fever sprang up in the Hankey, not from a morbific virus derived from the place she had just left, but from the foul condition of the vessel; which foulness, owing to some peculiarity in the African atmosphere, gave rise, by its modifying action on the poison of the endemic fever existing in the ship, to a new pestilence, which pestilence turned out to be true yellow fever. In other words, what in Africa was the common endemic of the country—a fever admitted to be not contagious—was, through the agency mentioned, converted into the yellow fever, which, owing to the power of contagion with which it became endowed, spread widely on the island, and was thence transplanted into this and other countries.

Of kindred nature is the story of the origin of the fever at Cadiz in 1819, which was heralded by no less an authority than Dr. Pariset, a man of high professional standing, and the then perpetual Secretary of the Academy of Medicine of Paris. Dr. Pariset was sent to Cadiz by the French government to investigate the question of the origin of the fever then existing there in an epidemic form, and arrived strongly impressed with the idea of importation and contagion—an idea in which he was supported by the majority of the physicians of the place; but after the most diligent search, he could not discover the source of introduction of the disease. He looked to vessels from this country, from Vera Cruz, and other places, but all in vain. Nothing for a long while could be found suitable for

his purposes, and yet, as he thought, the disease must have been imported, as it could not have arisen from the action of local causes. At last he hit upon the San Julian, a war vessel, which had arrived from Calcutta a short time before the outbreak of the epidemic, as the true or most probable source of the disease. It is true the yellow fever did not prevail at Calcutta, at the time of departure of that vessel, and has not done so at any time; but that did not embarrass the learned secretary and commissioner. If yellow fever did not exist there, cholera morbus (meaning, of course, Asiatic cholera) did, and what, he exclaimed, do we know of the transformation of diseases arising from individual predispositions, difference of climate, and other causes! After a good deal of theorizing on the subject, he came to a conclusion which met the approval of many of the physicians of Cadiz, as well as other parts of Spain, not to mention those of other countries, and which may be summed up in the following words: "The cholera morbus, a disease proved beyond doubt to be non-contagious, ravages India. The San Julian arrives at the isle of Leon (near Cadiz) from Calcutta, in a healthy state, without having had any one sick on board during a passage of four months—the yellow fever appears at Cadiz about the time of arrival of the vessel, and those who land from her, not those who remain on board, are seized with the disease, and the greater number die, from which it appears most plausible to Dr. Pariset that the ship introduced it; or, in other words, a disease which in India is cholera and bears but a distant resemblance to the yellow fever, and is, besides, non-contagious, can be transformed into that fever when transplanted into Spain by healthy men in a healthy ship, and there assume, and spread through means of highly contagious properties."

Here, then, we are presented with two epidemics growing out of two cases of conversion of diseases differing in symptomatology, pathology, and mode of propagation. In the one case it is the non-contagious African remittent which during a sea voyage is transformed into a highly contagious yellow fever; in the other case it is the cholera of India, which exhibits under like circumstances a similar change, becoming endowed with contagious properties it did not previously possess. Need I say that whether such conversions found advocates years ago, they are not in fashion at the present day, experience having done justice to them and led us to regard the accounts we read about them as tales fit only to amuse medical readers during their moments of leisure. Extravagant, however, as the above may be, and calculated, as they certainly are,

to excite the astonishment of well-informed readers, especially when these take into consideration the high professional standing of the writers who have promulgated them to the world, it may be doubted whether they are much more so than many other explanations of importation of the fever and statements in proof of its contagious property that have been offered. Let us examine the records of the profession, and we shall find that the greater number of these explanations are based, not on reliable facts and circumstances entitled to the respectful attention of the profession, but on conjectures, possibilities, probabilities, unauthenticated popular rumors respecting the arrival of infected ships, persons, or other means of communications, and on statements not seldom founded on occurrences of a trifling character and unlikely to exercise the most remote agency in the transmission of the disease from one place to another, and often in direct contradiction with well-established laws of etiology and pathology; while the few cases which appear to lend support to the opinion in question, or are more plausible than the rest, may be explained more satisfactorily in a different way. Nor do these instances of supposed importation always refer to places where the fever has never prevailed before, or at a distance from where it has done so on former occasions. They often relate to localities situated in the very heart of the yellow fever zone, where the fever has made its appearance, not long before, without the possibility of its being traced, after the most diligent search, to an exotic source, or in the vicinity of places where it may be said, from its frequent occurrence, to be endemical or indigenous, and where it is admitted to have recently prevailed, or to prevail, and to have been due to home cause.

With the above facts before me I undertook, at the suggestion of my colleagues in the Board of Health, to draw up the foregoing communication. I did so undeterred by the criticisms and censures, which, as I remarked, the performance of the task and the opinion expressed will, in all probability, entail upon me, not only because of the opinion I entertain of the incompetency of the mass of the public and not a few of my professional brethren to decide in matters of the kind, but because the events of the last summer may, I doubt not, lead, if properly represented, to a more accurate knowledge among us of the nature and mode of progression of the fever forming the subject of our inquiries, and the adoption and careful and strict enforcement of sanitary measures calculated to guard, as much as possible, against the visitations, and mitigate the effects, of

that disease, whether it originates from home causes or is introduced by an infected ship.

No one who has paid careful attention to the subject will, I am sure, accuse me of injustice when I express the opinion long entertained, and which time has only served to confirm, that the public at large seldom if ever possess the requisite qualifications, or devote the time necessary for investigations of the sort, and almost instinctively attribute the yellow fever, as, indeed, all wide-spreading diseases, to an exotic origin, and its propagation to the effect of exposure, with or without contact, of the well to the sick or to fomites. What I said in my work on yellow fever may be repeated here. Discovering nothing palpable in an infected spot to which they can refer the development of these—observing no difference in external agencies as regards meteorological phenomena and the condition of localities between healthy and unhealthy seasons—seeing the disease start up almost suddenly and spread rapidly, knowing at the same time that it prevails elsewhere, and also that vessels or individuals have arrived from places so visited, they cannot avoid the conclusion that when it shows itself among them it is necessarily the offspring of importation from contaminated localities. Nor can they perceive how a disease which spreads widely and quickly, which attacks persons who have had communication with the sick, and is, withal, as they think, imported, can do so otherwise than through the influence of personal contagion.

Turn we now to physicians, taken in the aggregate, and we shall find that the doctrine is not less acceptable among them—especially among the young, and those who have not investigated the subject with due attention—and particularly at the outset of an epidemical visitation, when the facts have not been sufficiently sifted, and minds are engrossed with the existing calamity. Some, doubtless, adopt those views after proper examination and careful study, and are led astray conscientiously from what I view—perhaps wrongfully—as the right path, by an adherence to preconceived and favorite theories relative to some points involved in the inquiry, and which they feel reluctant to abandon. The task of persuading even a most truthful and candid physician, that a theory he has long cherished, and regarded as well founded is erroneous, and must give way to another of an opposite kind, is not, and has never proved, an easy one. Especially true is this when that theory is one which the person called upon to abandon has labored long and assiduously, in speech and in writing, to sustain—a circumstance which has not unfrequently happened in

this city, but more particularly in other parts of the country. In the majority of instances, the conclusion is arrived at without due investigation, from want of time to devote to the task, or because, by so doing, a vast deal of trouble is saved, and all the circumstances of the case are, or appear to be, explained at once and in the simplest manner. To investigate the causes of disease, to collect and compare discordant and often obscure facts, and to draw deductions therefrom, and sift the grain from the chaff, is not so agreeable and easy a matter as to be undertaken in a satisfactory manner by practitioners of medicine generally, and is, for reasons assigned, beyond the scope of the public at large. These views become at last favorite objects of general belief, and there happens, in regard to them, what Locke long ago said of others of a different nature: "Men espouse the well-endowed opinions in fashion, and then seek arguments either to make good their beauty or varnish their deformity."

Criticism and censures, coming from individuals so ill qualified to indulge in them, may surely be disregarded without impropriety, knowing as I do that whether the estimate I have formed of the inadequacy of my anticipated judges be just or otherwise, it would not be difficult to show that I am fully borne out in the views I advocate by high professional authorities, who, though now, perhaps, in the minority, make up for their lack of numbers by a more ample share of experience and information in relation to the question before us than is possessed by their opponents. Let this be, however, as it may, sure I am, as already remarked, that the events of last summer, at the quarantine station and in this city, as also the unvarnished detail of them, cannot fail to lead to useful results. This no one will refuse to admit who reflects, that the picture thus offered, and the conclusions drawn from the facts recorded, besides tending, perhaps, to stem the current of public and professional opinion, which seems to flow once more in the direction of importation and contagion, are, I repeat, of a nature to point out, in a forcible manner, to the custodians of public health, the necessity of watching more carefully than, unfortunately, has always been done, the condition of vessels arriving during the sickly season from ports within the yellow fever zone, of omitting nothing required to prevent those that are infected from communicating the disease to individuals in their vicinity, by securing them during the period of their quarantine, and especially during the discharge of their cargoes, far from places of common resort—wharves, stores, dwellings—that might become contaminated; and, while

abstaining from destroying public and private property, and personal effects, on the plea that such articles have belonged to and been used by the sick on board, or were taken from a sickly ship, to keep everything about the station free from sources of infection, and to see that all such ships be subjected, with the strictest attention, to those measures of purification which experience has demonstrated to be useful. So far as regards the city itself, the events in question teach that the disease may and has originated from the operation of home causes of infection, that it is devoid of the power of spreading by personal contagion, and that while it is needless to destroy the clothing, bedding, and other personal effects of the sick, to order the immediate burial of the dead, and to prohibit funeral processions and church ceremonies; while, also, it is needless to quarantine individuals arriving at the lazaretto in infected or suspected vessels from sickly ports, whether those individuals be in health or laboring under the fever—the necessity of such measures being disproved by the fact already mentioned, that persons arriving by land from some distant infected place, and thereby avoiding all quarantine detention, or escaping from, or being allowed to leave, the lazaretto, and sickening after they reach the city, have in no instance, any more than those laboring under a sporadic attack, communicated the disease, either in private houses, hotels, or hospitals, to their friends or attendants; and if buried in the usual way, after the usual lapse of time, and with usual church ceremonies, have never caused a particle of mischief—and certainly what is useless in regard to one set of cases, cannot be requisite in regard to another;—while, I say, the precautionary measures mentioned may safely be dispensed with as useless and vexatious, it is the duty of those charged with the task to do all that is possible to prevent the generation of the efficient cause of the fever, and the consequent occurrence of the latter, or arrest its progress and attenuate its effects, if it has already broken out, by a resort to all the known means of purification, and especially by having all nuisances injurious to public health promptly removed, and the streets, gutters, courts, alleys, wharves, thoroughly cleansed, not only when the evil is upon us, but before it has come, and indeed at all times, though more especially during the summer season. Finally, I dare hope that the account presented of the source of the painful events through which we have recently passed, will, should the present communication, as well as the able report of Dr. Goodman, the port physician, attract the attention of the city authorities, open their eyes to the necessity of aiding the Board of

Health in its endeavors to secure public health, and guard against the recurrence of the yellow fever, by seeing, without delay, to the proper drainage and paving of the streets, alleys, and all other parts of the kind under their jurisdiction, and to the construction of the gutters in accordance with a plan calculated to enable those whose duty it is to keep them at all times in a proper hygienic condition, to effect that object in a satisfactory manner.