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**Contributors**

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Royal College of Surgeons of England

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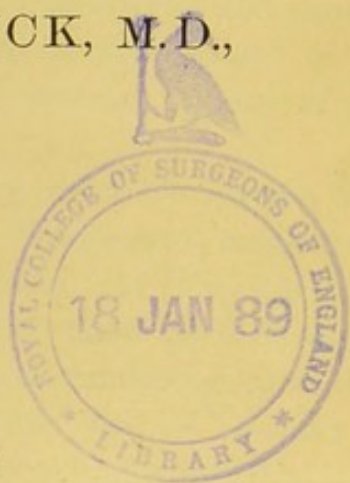
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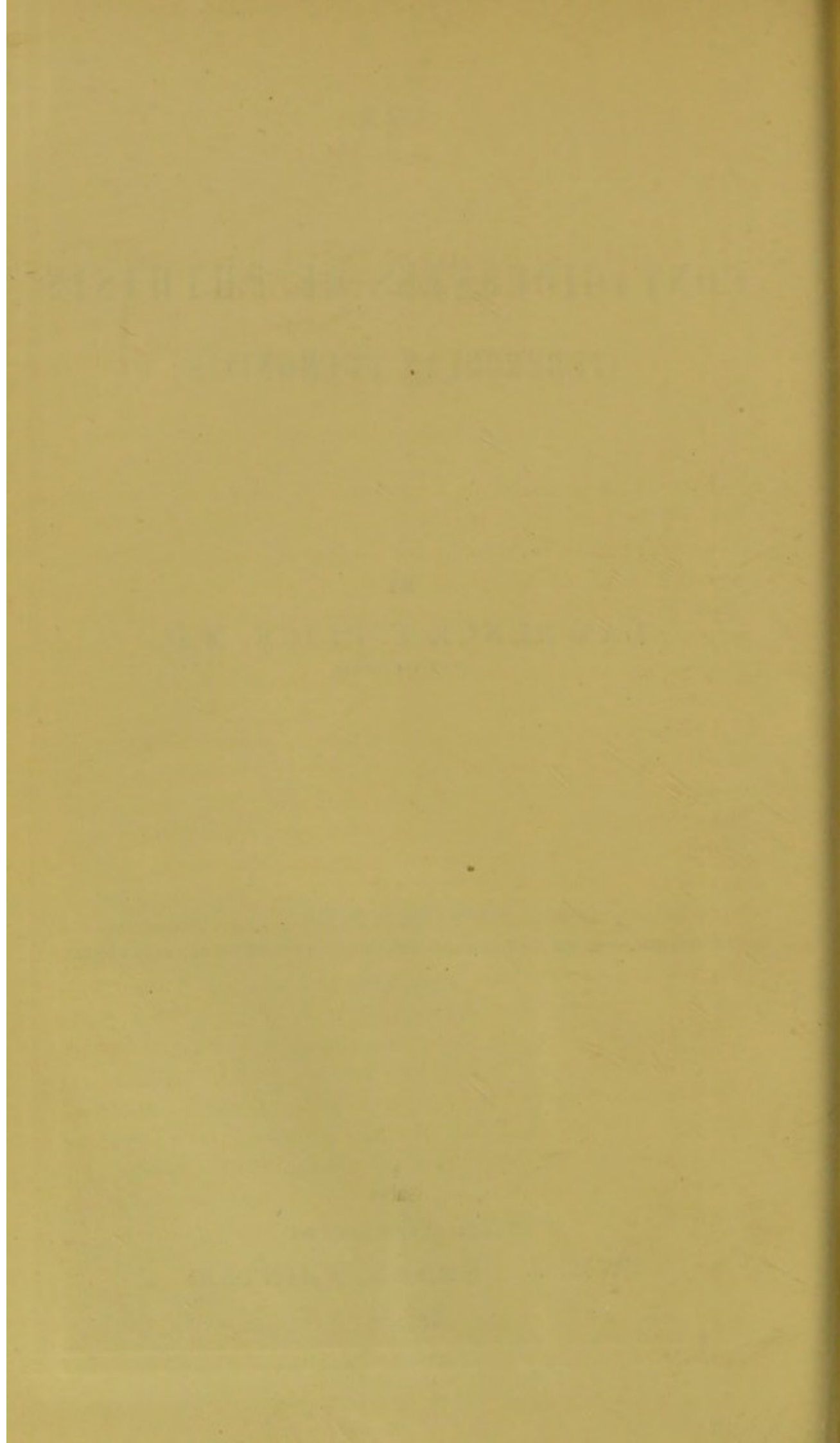


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## THE CONTAGIOUSNESS OF PHTHISIS (TUBERCULAR PULMONITIS).

BY LAWRENCE F. FLICK, M.D.,  
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EVER since medicine became a science, the contagiousness<sup>1</sup> of phthisis has been one of the mooted questions. In different epochs of medical history the opinions of medical men and the beliefs and superstitions of the laity have tipped the scale on one side or the other, but never has the question been settled practically and permanently the world over. And yet, until it is so disposed of, no progress can be looked for in either the prevention or cure of the disease.

Isocrates, who lived about the fifth century before Christ, and who shortly preceded or was contemporary with Hippocrates, taught that consumption was contagious,<sup>2</sup> but apparently had few disciples. Hippocrates himself, in his book, discoursed upon phthisis as an epidemic. He, however, apparently believed the disease to be due to a certain condition of the air, and evidently did not consider it communicable from person to person by contact and association. It was rather a quality of the atmosphere or of the breezes that affected people than germs of disease. His was the usually accepted theory, and one which prevailed for many years. Many of the greatest minds, however, who gave thought to medical subjects, from his day until toward the end of the eighteenth century, believed consumption to be contagious. Such men as Aristotle, Galen, Lommius, Ballonius, Riverius, Morton, Hoffman, Morgagni, Lieutaud, Van Swieten, Cullen, Reid, Raulin, Withering, Emale, Selle, Darwin, and Baume taught the doctrine.<sup>3</sup> Valsalva, who believed himself predisposed to the disease, avoided being present at dissections of the

<sup>1</sup> I use the word contagious in its broadest sense.

<sup>2</sup> Francis Adams's translation of Hippocrates.

<sup>3</sup> Young, on Consumption.

lungs of persons who had died of consumption, and Morgagni is said to have done the same thing.<sup>1</sup> The doctrine must have been pretty generally believed and taught throughout Continental Europe at one time; but the only traces of it left at the present day are among the peasantry of Italy and Spain, by whom consumption is dreaded as much as smallpox. England seems never to have been willing to accept the doctrine. English colleges declared against it in a body,<sup>2</sup> and most English writers controverted it. Toward the end of the eighteenth century, Dr. Heberden wrote: "In England we have very little apprehension of the contagious nature of consumption, of which, in other countries, they are fully persuaded." In the early part of the present century, Dr. James E. Smith wrote "that in Italy consumptions are found contagious, though less evidently so in England."<sup>3</sup> In some parts of Spain and Portugal, writes Dr. Rush, when on the subject of consumption, "its contagious nature is so generally believed that cases of it are reported to the magistrates of those countries, and the clothes of persons who have died of it are ordered to be burned."<sup>4</sup>

During the last century the far-reaching influence of English civilization has so obliterated the doctrine that to revive it will, to many, appear an invention. The only countries in which it at present appears to be bearing any practical fruit are Greece and Turkey, where governmental disinfection is said to be carried out with marked benefit. The discovery of the bacillus tuberculosis during recent years has created new interest in the subject, which, it is to be hoped, will lead to a practical solution. In England and America, however, traditional prejudices are so strong against the doctrine that they will have to be removed before it can receive an impartial hearing and gain a lasting foothold. Medical science, however, is bringing us to that stage at which it is important for every country which desires to be abreast of the times to take up a position on the subject other than one based upon handed-down belief.

Either consumption is contagious, or it is not. Whether it is or is not ought to be easily ascertained at the present day. Such diseases as smallpox, measles, scarlet fever, diphtheria, and typhoid fever are universally accepted as being contagious; and the same process of reasoning which led the profession and the public to

<sup>1</sup> An Inquiry into the Cause and Cure of Pulmonary Consumption, by Rush, page 57.

<sup>2</sup> Young, on Consumption. <sup>3</sup> Gregory's Dissertations, page 157. <sup>4</sup> Supra, page 57.

that conclusion, if the facts are the same, ought to bring them to the same conclusion in phthisis.

The difficulty in the way of making a comparison lies in the great difference in the duration of the diseases—the former always being acute and the latter usually chronic, and, even when acute, of comparatively long duration. This especially holds good in that portion of the disease known as the incubation period. In acute diseases it is comparatively easy to note the length of time which elapses between exposure and determining symptoms of the disease; but in chronic diseases, and especially in phthisis, this is no easy matter. With these facts before us, I will endeavor to show that phthisis is contagious for as many reasons as any of the admittedly contagious diseases, and that it is governed by the same laws of contagion as are the others.

But before proceeding to advance arguments upon the point at issue, it may be well to remove some of the cobwebs of prejudice which have been accumulating for centuries. The most closely woven of these is the theory of heredity. So integral a part of the medical belief of the average man and woman is this theory that to call it into question would to many be *prima facie* evidence of genteel insanity. The world is governed more by belief than by knowledge. Born to the doctrine, most people have accepted it without investigation, and cling to it with fanatical pertinacity. Hereditary consumption, as a theory embodying a scientific truth, will, however, not bear the light of reason. Webster defines hereditary as “transmitted, or capable of being transmitted from a parent to a child.” The word is derived from the Latin “hereditas,” an heirship, an inheritance, a patrimony. In a physiological sense anything transmitted from a parent to an offspring must be an intrinsic part of the parent. A quality, for example, can be transmitted, such as color of hair, complexion, etc.; or traits of character, such as temper, affection, and such like. Disease, however, is an entity in itself, and, therefore, extrinsic to the parent. It is temporarily engrafted upon a person, and unless it can be cast off will put an end to physical existence. As long as even a vestige remains in the body there is constant warfare between it and the economy. It is quite reasonable that a child conceived, matured, and born whilst this conflict is going on will or, at least, may be affected by the same disease which afflicted the parent, for the child is part of the parent; but it is contrary to all reason that

a child born of diseased parents, or of healthy parents whose parents or grandparents were diseased, can be healthy at birth, and ten or fifteen or twenty, or any number of years thereafter develop that same identical disease which the parents or grandparents had, from a something which it got from those parents or grandparents. To accept such a doctrine would be to make disease a physiological condition, or a quality of the body.

But many will say, Why fly in the face of truth and contradict that which is self-evident? Do not we all daily see the best evidence of hereditary consumption in whole families becoming extinct from it? A careful study of such families and their mode of exit from mortal clay will give the most striking proof of the contagiousness of phthisis. A few examples will illustrate my point:

Family S. has been sadly afflicted by the disease. About five years ago E., a daughter, who was a factory girl and who had worked hard and had been suffering from dyspepsia for a year or more, took the disease. She lived in a neighborhood where the disease was prevalent and she had been making frequent visits to and had helped nurse a cousin on the father's side, who was dying of the disease. She lingered about two years and died. Her mother, who had undergone many hardships during life, and who was quite delicate and suffered much from dyspepsia, nursed her during her illness. During the latter part of the daughter's illness the mother began to develop the disease, and two years after her daughter's death followed her to the grave. During the mother's illness, the eldest son, who had been lately working indoors, began to develop unmistakable symptoms of the disease. He resumed outdoor employment, to which he had been accustomed, and after several months recovered and is well at the present day. The father and husband, who had been a very robust man, but who had lived a life of dissipation for many years until within six months of his wife's death, now also developed the disease, and is at present within view of the land of the majority. Family Sh., who lived very close neighbors to the above family, has been almost entirely exterminated by the disease. P., the eldest son, died first, after an illness of six months. In one year he was followed by the father. The mother died next, one year after the father; and she was in turn followed in two years by the eldest daughter. Within less than a year of the latter's death the youngest child died of tubercular meningitis. The only remaining members of the family are two

boys and one girl, and, of these, the youngest had every indication of tubercular deposit in the lungs about the time at which his sister died of tubercular meningitis, but recovered, and the other brother is at present apparently struggling with tubercular deposit.

These families are looked upon by their neighbors and by every one who knows them, or anything about them, as practical demonstrations of hereditary consumption. And yet, if those same families had died, in the same order of succession, of a disease which runs a shorter course, no one would have doubted its contagiousness.

If recurrence of a disease in the same family disproves contagiousness, every acceptedly contagious disease can be proven to be non-contagious by the same process of reasoning. In family F., for example, consisting of twelve members, six have had typhoid fever at different times, and in different parts of the country. Is it, therefore, hereditary? Some families will not contract scarlet fever under the worst exposure. Does this disprove the contagiousness of scarlet fever? These facts, individually, lead to false conclusions, but, collectively, argue a most important truth; namely, that there is a family as well as an individual predisposition to certain diseases. Every fort does not yield to the same weapons of assault.

Unfortunately, predisposition is constantly confounded with heredity, even by the profession. A little thought, however, will clear up the subject to any one who is willing to give it. Predisposition being a quality of the body, can be transmitted consistently with the laws of physiology; or, in other words, it is hereditary; but disease, which is foreign to the body, cannot be so transmitted. Parents can give to their offspring a peculiar shape, a peculiar nervous system, a peculiar digestive apparatus, or even condition of the blood which will make them more or less liable to this or that disease; but they cannot instil into them germs of disease which will, in after life, unexpectedly develop and crush them to the earth.

But to come to direct argument, probably the most logical and most convincing proof of the contagiousness of a disease that can be offered, is to show that it did not exist among people and in countries until it was introduced from without. Unfortunately, consumption is such an old disease, and one which claims its victims so generally throughout the world, that it would be very difficult

to find a country in which it does not exist. History, however, helps us out.

Prior to the advent of the white man, and, especially, the Englishman, among the American Indians, consumption did not exist in America. Dr. Benjamin Rush, a man whose word can scarcely be doubted, said over a hundred years ago, "that it is unknown among the Indians of North America."<sup>1</sup> Even after the arrival of the Europeans the country remained comparatively free from the disease for many years.

In the same paper above quoted, Dr. Rush said: "It is scarcely known by those citizens of the United States who live in the first stage of civilized life, and who have lately obtained the title of first settlers."

In the early part of the eighteenth century, Lieutenant-Governor Colden wrote about New York: "The air of the country being almost always clear, and its spring invigorating, we have very few consumptions or diseases of the lungs." . . . "People inclined to be consumptive in England, are often perfectly cured by our fine air; but if there be ulcers formed they die."<sup>2</sup>

When we consider that these statements were made from fifty to a hundred years after the first settlement of America by Europeans, it will be clear that the disease was slow in getting a foothold here.

In addition to this direct testimony, there is strong inferential evidence that the disease was introduced into America from Europe. The two countries which were most active in the early population of what is now the United States were England and Spain. England never accepted the contagious theory of phthisis and never practised any preventative measures. During the seventeenth and eighteenth centuries, consumption was what might be called endemic in the British kingdom, as during at least part of that time, from 33 per cent. to 50 per cent. of the deaths were due to that disease.<sup>3</sup> As this was the most active epoch of English emigration, and as many consumptives were no doubt attracted to America by the reputation it had of being free from the disease, infected spots were soon scattered all over the northern and eastern portions of the

<sup>1</sup> Treatise upon the cause and cure of pulmonary consumption, vol. ii. page 37.

<sup>2</sup> Gregory's Dissertations, page 151; also American Med. and Philos. Register, vol. i.

<sup>3</sup> Historical Survey of the Diseases of London, page 22, by Thomas Bateman. Also Dr. Willan's Statistics.

country. This fact led Dr. Rush to say: "Its rapid progress among us has been attributed unjustly to the growing resemblance of our climate to that of Great Britain."

And Mr. de Witt Clinton, of New York: "If the climate of New York was formerly thus mild and healthy, and a constant amelioration in its temperature is consequent upon our numerous settlements and improvements, as has been maintained by distinguished writers, to what shall we ascribe the extraordinary mortality occasioned by consumption at the present day?"<sup>1</sup>

Another writer, Dr. Lettson, in a letter from London, near about that same period, says: "Whilst the phthisis pulmonalis is rapidly increasing in America and in the European continent, it is diminishing here."<sup>2</sup>

The indisputable fact is that England was, during the seventeenth and eighteenth centuries, a propagator of consumption throughout the world; and that wherever an English colony settled, phthisis pulmonalis became epidemic in the course of time. So noticeable was this fact at one time that consumption received the title of the English disease.

But the most striking fact is that, wherever England colonized, the Indians took the disease, and it in course of time became more prevalent among them than it was even among the English. A study of the literature on this subject will show that the disease increased among them from east to west, and that, with some modification, the more recent the report the greater the mortality. John D. Hunter, Esq., who was a captive among the western Indians for fifteen years, wrote to Dr. Henry W. Durachet, after his return in 1822: "I have known pulmonary consumption to occur among the Indians. It is rarely seen, however, except in those who are addicted to intemperance, and even in those cases it is by no means as common as among the whites. It is worthy of notice that their females are not as much subject to the disease as the males are."<sup>3</sup>

George B. Buckley reported to Governor Stevens, in 1854, that "Indians east of the Rocky Mountains suffer from inflammation of the eyes and consumption."<sup>4</sup>

Dr. Thomas Williams writes of the Dacota Indians of Minnesota,

<sup>1</sup> Gregory's Dissertations, page 153.

<sup>2</sup> Ibid. page 150, or Amer. Med. and Phil. Reg., vol. ii.

<sup>3</sup> Amer. Med. Record, Philada., 1822.

<sup>4</sup> Report to Gov. Stevens, of the East. Div. of Expl. for the Pacific Railroad, p. 178.

in 1870: "Of those over ten years who die of disease, I think half die of consumption."<sup>1</sup>

Now if, with this picture of the growth of phthisis pulmonalis in that portion of the United States which was colonized by England well fixed in our minds, we turn to study the development of the disease in the Spanish colonies of our country, we will arrive at results which cannot be explained except upon the theory of contagion.

At the time when Spanish immigration into the present territory of the United States was active, governmental disinfection was in all probability practised in Spain. It was certainly practised in the latter part of the eighteenth century.<sup>2</sup> Those portions of our country which were settled by the Spaniards, namely, California, Arizona, New Mexico, Texas, Florida, and Colorado, were almost absolutely free from consumption until they became the Sanatoria of consumptives from the north and northeast. Intelligent natives of those countries will tell you that, prior to the mingling of the English-speaking people amongst them, the disease did not occur in their country. In fact, it was the generally acknowledged freedom of those places from the disease that gave them their reputation as resorts for the phthisical. But, while everybody is ready to admit these facts, climatologists claim that the comparative absence of the disease from those countries is due to the climate. They, however, fail to explain why consumption becomes prevalent in those regions as soon as they have been resorts for consumptives for some time. In this way some of the finest phthisical climates have lost their reputation, and have gotten to be shunned as places to be avoided. Santa Rosa, in California, is such a place. Indeed, the whole Pacific Coast, as well as Florida and Colorado, is acquiring a doubtful reputation for consumption. A look at the map of the U. S. Census Report for 1880, in which the topography of phthisis throughout the United States is indicated, will be apt to shake the confidence of the searcher after a climate for the cure of consumption, so far as those countries are concerned at least. That the change is due to the introduction of the disease by people from the older States will appear evident from the fact that in proportion as the sections of our country which were settled by the Spaniards have been less frequented by English-speaking people, and for a shorter

<sup>1</sup> Northwestern Med. and Surg. Journ., 1873, vol. xiv. page 412.

<sup>2</sup> Treatise upon the Cause and Cure of Pulmonary Consumption, by Dr. Rush.

period, they are freer from consumption. The Indians, moreover, who were in contact with the Spaniards for centuries, remained free from the disease, and some tribes remain free from it to this day.<sup>1</sup>

America is, however, not the only country which was free from consumption until the disease was introduced from without. The islands of Bermuda and Madeira probably underwent the same experience. Both, at one time, enjoyed the reputation of being ideal climates for consumptives. They have both lost that reputation because the disease became too prevalent there. The history of Madeira is especially interesting. The natives of that island so feared consumption that "no pecuniary consideration whatever would induce them to accommodate phthisical patients,"<sup>2</sup> wrote Dr. John Gordon, in 1784. And well they might fear it, for, after years of introduction by the English, the disease became endemic in the island. Dr. William Gourlay wrote, in 1811, "that the disease of phthisis pulmonalis was an endemic in the island, and that its fatality was prodigious among the inhabitants."<sup>3</sup>

There is reason to believe that also the Jewish people were free from the disease whilst they dwelt in the Promised Land.<sup>4</sup> The disease is referred to in the Old Testament as a disease of Egypt, and is spoken of as a visitation or plague.

Africa was also free from consumption until its inhabitants began to associate with other races. By Africa, I, of course, mean that portion of the continent occupied by the colored race. Dr. Millard writes: "I have excellent authority for saying that the disease is rare among the negroes in Africa, and in the interior is almost never known."<sup>5</sup>

The disease exists along the different coasts, and prevails in ratio as the natives associate with the outside world. When the negro is taken from his native country into a country where the disease is prevalent, he is almost certain to contract it.

But the theory of the contagiousness of phthisis does not depend upon historical argument for its establishment. I have already said that it can be proven by as many reasons as can be adduced in favor of any of the acceptedly contagious diseases; and I, of course, had in view scientific reasons.

<sup>1</sup> Does Pulmonary Consumption tend to Exterminate the Indians? By Thomas J. Mays, M.D.

<sup>2</sup> Gregory's Dissertations, page 74.

<sup>3</sup> Ibid., page 72.

<sup>4</sup> Deuteronomy, xxviii. 22, Cruden's Concordance.

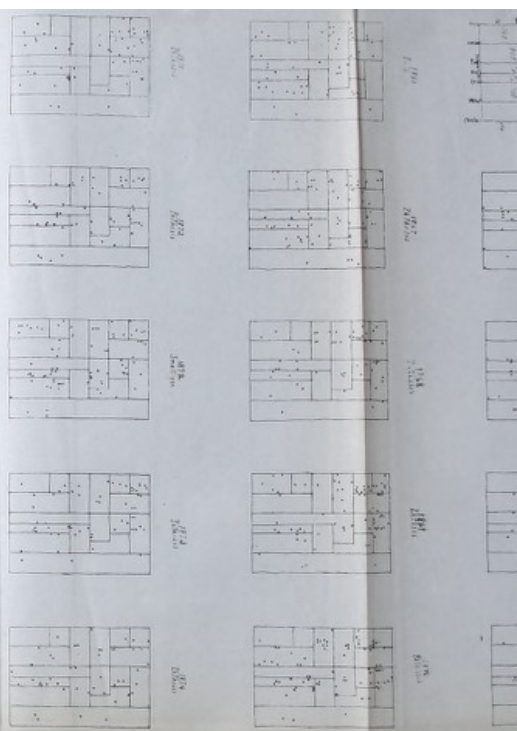
<sup>5</sup> The Clim. and Statis. of Consumption, page 67.

The most prominent scientific ear-mark of the recognized contagious diseases is the fact that the persons who come in contact with the affected persons, or who live in close proximity to them, may fall victims to the same disease. In proportion as a larger or smaller number of the exposed contract the disease, the contagion is termed mild or strong. In some diseases, almost every one who comes in contact, and who is not protected, will contract the disease; whilst in others comparatively few take it. Yet, inasmuch as only those who come in contact, or are in close proximity, fall victims, the latter is as truly contagious as the former, differing only in degree. In other words, contagious diseases are dependent upon a disease germ, and cannot be contracted, except through the medium of that disease germ. Every case is dependent upon some other case, and no case can spring up of itself.

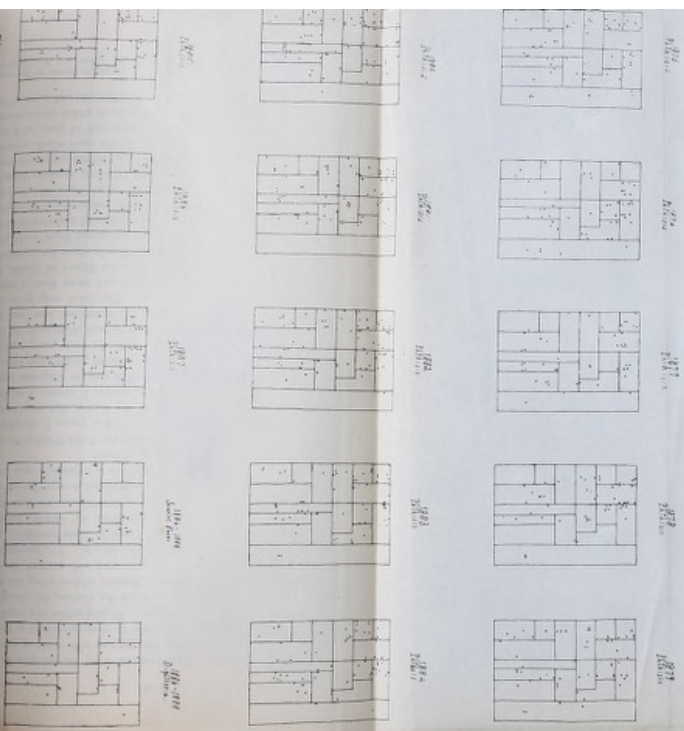
By a topographical study of phthisis in the Fifth Ward of the city of Philadelphia,<sup>1</sup> for a period of twenty-five years, I am able to show, as well as this can be shown of any disease, that consumption observes this law. To illustrate the matter, I present a series of three maps, the first and second of which contain diagrams representing the approximate locality of all cases of phthisis and hæmoptysis which could be located in the ward for each year; together with diagrams of all cases of scarlet fever and diphtheria for two years each, the deaths from typhoid fever for one year, and the deaths from smallpox for one year. The third map gives the exact location of all deaths from phthisis and every form of tuberculosis, which were properly returned to the Board of Health, for the entire period of twenty-five years. I only claim for these maps as great a measure of correctness as conscientious labor could give them. Mistakes in the returns of physicians and undertakers to the Board of Health, and such mistakes as are inseparable from copying long records, as well as the practice of returning deaths from the offices of undertakers, and the change of street numbers, have, of course, somewhat interfered with both their fulness and correctness; but they contain at least 90 per cent. of the cases which occurred in the ward during the twenty-five years, and of these, at a low estimate, 85 per cent. are located at the place at which they occurred. Only the deaths are represented in consumption, and some allow-

<sup>1</sup> I desire here to express my appreciation of and return thanks for the many kindnesses shown and assistance given me by Messrs. Turner and Murray, of the Registry Department of our City Board of Health.



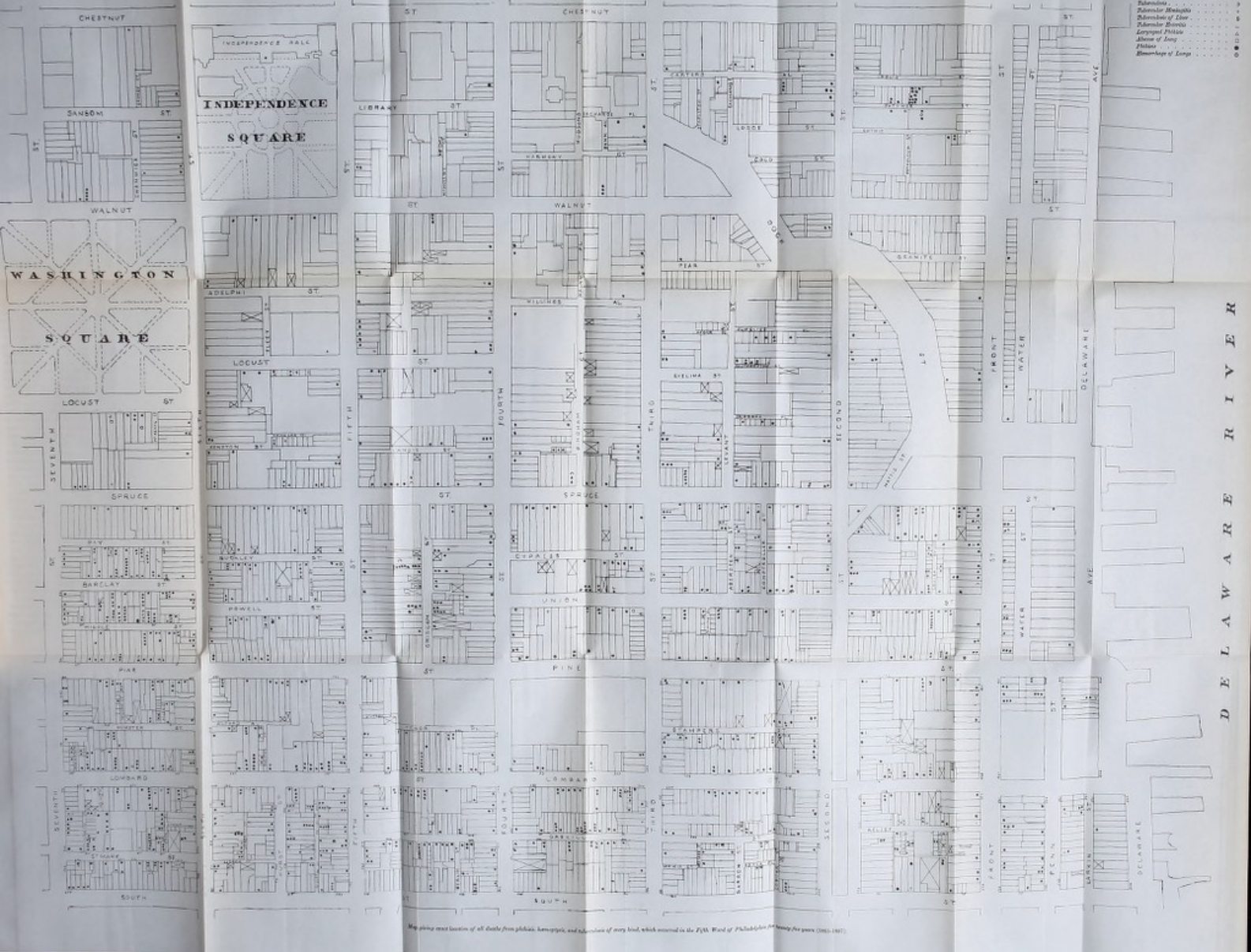


# MAP II.



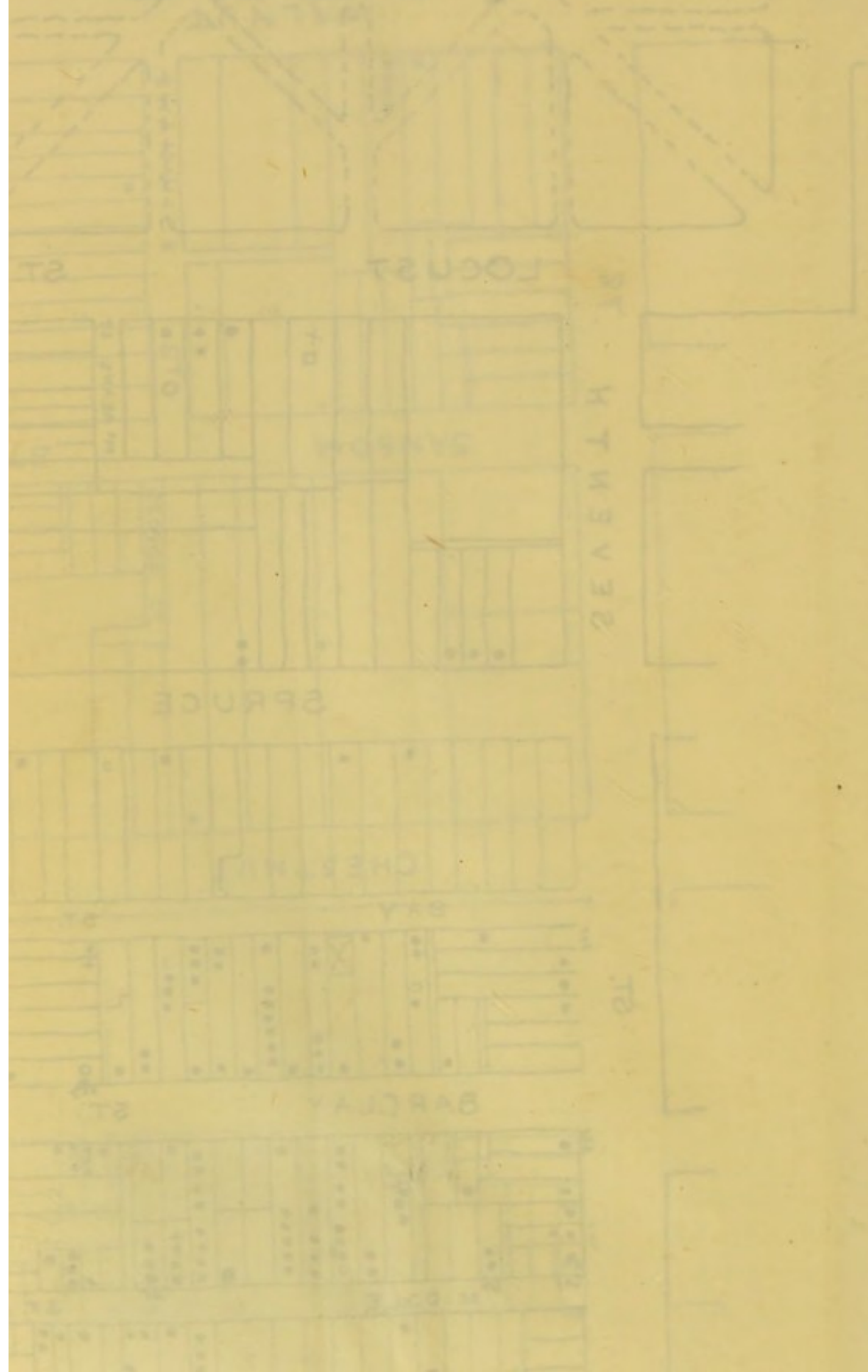
Diagrams of the Fifth World of Probability, in which are approximately located all double points, probably for each point from 1000 to 10000.

# MAP III.



DELAWARE RIVER

SOUTH



ance must be made for recoveries, and for change of residence shortly before death. As regards the latter, I do not think that the general result is much affected by it. With the exception of a small boarding-house population, the people of the Fifth Ward are probably more fixed in their residences than in any other part of Philadelphia. They are mostly poor people, but few belonging to the middle class, and probably none to the wealthy. Of all classes of people, the poor are least likely to change their places of abode, and when they do have to change them, they go as short a distance as possible; for around that spot, be it ever so low and miserable, is centred for them all that is embodied in the word home. By careful inquiry, I have found that in even those portions of the ward which are usually looked upon as the homes of no one, but the moral pitfalls of many, the deaths returned from phthisis were those of permanent residents. That the broken-down men and women who frequent such neighborhoods mostly die of phthisis, I am aware of; but an investigation of the subject has convinced me that such cases are never reported from those localities, and that the number of deaths reported represents but a small percentage of the cases contracted in them. During the twenty-five years ninety-nine cases were returned to the Board of Health as having been buried from the residences of undertakers, the majority of whom had died in hospitals (mainly Blockley), and had probably been residents of such localities and had contracted the disease there. From my own practice, I know, moreover, that persons who have drained the dregs of vice in those dens of iniquity return into the bosoms of their families when stricken down by phthisis, there to make their peace with God in the glow of parental love; and that, when this is impossible, their memories are at least screened by burial from some other place than the one which witnessed their degraded lives. Even those who have been severed entirely from friends and relatives find a charitable obscurity in the Potter's field or on the dissecting table. Could a true picture be drawn of all the cases of phthisis contracted in such centres of infection what a sad spectacle it would present.

A study of the diagrams on Maps Nos. 1 and 2 will show that consumption is centralized; that it gradually changes its centre; that it completely changes its centre every three or four years; that it reappears in the same locality in from one to two years; that it has a preference for filthy neighborhoods; and that its grouping is

identically the same as that of typhoid fever, smallpox, scarlet fever, and diphtheria. Of scarlet fever and diphtheria, although I give all the cases which occurred in the ward during two years, there are not enough to show a good grouping, which, when compared with the deaths from consumption for a single year, will bring in strong contrast the fatality of a disease which no one fears and against which there is no protection, except such as every individual can secure for himself; and diseases which every one dreads and for the prevention of which the Government, most properly, spends a large sum of money every year. Even as between smallpox and consumption and typhoid fever and consumption, during years when the former were raging as epidemics, the mortality from the former was no greater than it is from consumption every year.

In order that the density of population may be studied in connection with the localization of the disease, I have divided the ward into election districts, and have given the population of each district, computed upon the election returns for 1887. This places the population of the ward a little below the census returns for 1880, but makes it near enough correct for practical purposes. I may also say that I have selected the Fifth Ward for my demonstration because it is one of the oldest, and has a fixed population, and its people are of an even class.

Map No. 3, which is a careful drawing of all the building lots in the ward, taken from actual surveys, and therefore absolutely correct, and which has located upon each lot the number of cases of consumption which occurred upon it during the twenty-five years, as correctly placed as care could place them, will show that a house which has had a case of consumption will probably have another within a few years, and may have a very large number of cases in close succession; that when a case of consumption occurs in a house, approximate houses are considerably exposed to the contagion; that houses in localities where endemic after endemic has existed have, nevertheless, escaped the disease; that tubercloses of various kinds occur in the same localities, and often on the same lots as consumption; that whilst density of population and filth attract the disease, thinness of population and cleanliness afford no protection when the disease germ is introduced into a locality; that the disease has a decided predilection for the colored race; and that during the twenty-five years scarcely twenty per cent. of the houses of the ward were infected.

A comparison of the three maps will show that cases are grouped, not only in locality, but also in time of occurrence. This, however, does not show as well in the map as the facts warrant; but it could not be shown better, except by giving the date of death of each case, which is practically impossible. Frequently several deaths occur in the same neighborhood within a few weeks, and sometimes even a few days of each other.

Of the infected houses scarcely ten per cent. are isolated—that is, standing by themselves—or, rather, not having an infected house next to them. About thirty-three per cent. of the infected houses, moreover, have had more than one case. These two facts alone seem to me to warrant the conclusion that consumption is never contracted except either by contact, by association, or by living in close proximity.

How closely consumption follows this first law of contagious diseases is best demonstrated by a comparison of the diagrams of smallpox, typhoid fever, diphtheria, and scarlet fever with those of phthisis. It will be found that the grouping is identically the same, as well as the localization, except in scarlet fever, in which disease the localization is influenced by the age of those predisposed to the disease.

Another distinguishing mark of contagious diseases, and one well demonstrated in the diagrams, is the fact that, after it has used up all the available material in a district, it dies out, to reappear when new matter fit for its operation presents itself. Although I have already referred to this point, I will expatiate upon it somewhat, as it is in itself almost positive evidence of the contagiousness of a disease. It is this law of self-limitation which produces what are called cycles of disease, which in days of bad hygiene constituted scourges. The duration of a disease regulates the time required for its self-extinction. Most of the contagious diseases run a rapid course, and, therefore, produce short epidemics. Phthisis being of long duration, each individual case can infect all the susceptible persons who come in contact with it for a number of years, and in this way the epidemic becomes prolonged. The duration of endemics, as they are properly called, appears to be about three years, some being longer and some shorter. A series of endemics, dovetailing into each other, give a city and the country at large the appearance of a perpetual epidemic which yearly claims nearly the same number of victims. An analysis, however, of the facts shows

that the large epidemic consists of a very large number of small endemics.

Another landmark of contagious diseases, and one which I have likewise already touched upon, is that they develop preëminently in filthy neighborhoods, in which the outside and inside hygienic conditions of dwellings are bad. The compliance of consumption with this law is well demonstrated by the diagrams. It will be seen that it occupies the very same localities as typhoid fever and small-pox; and my notes show that it often occurs in identically the same houses.

Another characteristic of contagious diseases is that persons become acclimated to them. From a scientific point of view, this is possibly one of the most interesting features of a contagious disease. It is a physiological principle that the human economy will in time accommodate itself in a measure to the presence of foreign and even detrimental substances. In this way we in time become proof against the most deadly poisons. It is for this reason that the first part of an epidemic is always the most fatal; and that in the early part of an epidemic a disease proves fatal in a shorter period of time than in the latter part of it.

The history of consumption in all new countries into which it has been introduced, shows that it has had a rise, a climax, and a decline in prevalency. The islands of Madeira and Bermuda illustrate this fact, and the progress of the disease from east to west in the United States points to it with great emphasis. In New York City, from 1804 to 1820, the deaths by consumption were 1 in 4.2; from 1820 to 1835, 1 in 5.4; from 1835 to 1850, 1 in 6.5; and from 1848 to 1859, 1 in 8.46.<sup>1</sup> In Rhode Island the percentage of deaths from consumption was, in 1867, 20.74; in 1883, 15.03.<sup>2</sup> In this way I might quote the mortality statistics of all the older States and cities, showing a decrease; and those of the newer ones and the Territories, showing either a stand-still or an increase. The avidity, however, with which the disease takes hold of new material illustrates its subservience to the law of acclimatization better even than its history in different countries. It has almost exterminated some of the tribes of American Indians; it has decimated the natives of probably every island which has been colonized by England during the last few hundred years; and wherever it

<sup>1</sup> The Clim. and Stat. of Consumption, by H. B. Millard, page 18.

<sup>2</sup> Health Reports of Rhode Island.

comes in contact with the native-born colored people of Africa its fatality among them is marvellous.<sup>1</sup> In Egypt the Negroes and Abyssinians are decimated by it.<sup>2</sup> In Gibraltar, the comparative deaths per 1000, for twenty years, between whites and blacks has been: whites, 6.1 per 1000, and blacks, 33.5 per 1000.<sup>3</sup> During the early history of America, while the slave-trade was going on, the proneness of the colored race to contract consumption was frequently noted. Dr. Rush records an instance where several colored servants were brought into a New England family in which the disease existed, and all contracted the disease. The marked decrease in mortality among the American Indians, after it has existed among them for a number of years,<sup>4</sup> and the present mortality among the colored people of the United States, in connection with the severity with which it at first attacks both these races, are ample evidence that the law of acclimatization is in operation among them in regard to consumption. I have, moreover, myself observed that country people who move into infected districts will more readily contract the disease, and will have it in a more acute form than persons who have always lived in those districts.

Another mark of contagious diseases is that, while in active progress, they will not tolerate the active presence of any other contagious disease. To this law there are said to be some exceptions, but they so seldom occur that they may be said to prove the rule. As regards consumption, I have been unable to find a single authenticated case in which any other contagious disease was concomitant. Dr. Welch, of the Municipal Hospital, in this city, writes me: "Although I have seen upward of 5000 cases of smallpox, I do not recollect that I ever came across one in which there was also well-marked and advanced phthisis. Possibly some of these patients may have been suffering from phthisis in its incipient stage; on this point, however, I cannot speak positively, since I have no recorded observations in that direction."

Dr. Taylor, of the Board of Health of this city, tells me that, in his experience with contagious diseases of every kind, he does not recollect having ever seen any other contagious disease in a person suffering from consumption. Dr. Longstreth, Pathologist to the

<sup>1</sup> The Clim. and Stat. of Consumption, by H. B. Millard.

<sup>2</sup> Ibid., page 70.

<sup>3</sup> Ibid., page 64.

<sup>4</sup> Does Pulmonary Consumption tend to Exterminate the American Indians? N. Y. Med. Journ., 1887, vol. i. page 508.

Pennsylvania Hospital, informs me that in twenty years, during which he has been connected with that institution, he has never found consumption in an autopsy for typhoid fever. The only cases of even alleged coexistence of consumption and other contagious diseases which I have been able to discover, occurred in Riverside Hospital, New York, but I have been unable to get such notes in regard to them as are necessary for scientific use. It is to Dr. L. L. Seaman, of New York, that I owe my knowledge of their existence. He writes me: "In reply to your question, 'Have you ever seen a case of smallpox, measles, diphtheria, or scarlet fever in a person suffering from phthisis?' I can give an affirmative answer. I have seen fatal termination in each of the above cases; but for more definite information, notes, etc., I must refer you to the officers of the Riverside Hospital, Board of Health, New York City."

Unfortunately that Board did not deem it worth while to reply to my note of inquiry for further information. In order to throw some further light upon the subject, my friend, Dr. William M. Angney, physician to the Consumptives' Home, of this city, kindly offered to vaccinate a number of consumptives for me. Two of the cases which he vaccinated at the Home took mildly. Both cases, I believe, had cavities, and the doctor informs me that in both cases the disease was active at the time of vaccination. In neither case was the vaccination typical, but inasmuch as the cases were secondary, this could not be expected. At the same time, however, the doctor vaccinated a woman at the Pennsylvania Hospital, who was believed to be suffering from phthisis, but of whose case there was some doubt, and she developed true vaccinia. Thus, as far as I have been able to gather facts upon the subject, the preponderance of evidence seems to point to the non-concurrence of consumption with other contagious diseases. An astonishing fact in connection with this matter is, that during the reign of the severe epidemics of typhoid fever and smallpox, in 1864-65 and 1871-72, deaths from consumption decreased, to become augmented as soon as the epidemics ceased. This might argue that some consumptives died of typhoid fever and smallpox during those years, were it not that the mortality from consumption throughout the whole city, for those same years, was much above the average.

Another mark of contagious diseases is that they have media of contagion peculiar to themselves. Diphtheria has the membrane

in the throat, scarlet fever has the decayed epidermis, small-pox has the pus from the pustules, typhoid fever has the discharges from the bowels, and phthisis has the sputa. Whether or not the contagion is confined to these various peculiar excretions and discharges, I do not know; but I believe that they are the most important media. As regards consumption, I am inclined to think that tubercular pus, formed in any part of the body, will produce the disease if the disease germ from that pus gains entrance into and secures a lodging in the lung. Whether or not the bacillus tuberculosis is the "fell destroyer" I do not know; but that he dwells in the pus, whether it has formed in the lung or anywhere else, I do believe. It is possible that, like so many other parasitic beings, he parades under different forms in different media, and that some of his aliases are yet to be discovered. At any rate, I am under the impression that his principal avenue into the human economy is through the stomach, and that only when that organ is off its guard can he secure an entrance. As a perfectly healthy stomach will digest and destroy the cholera bacillus, so I believe will it destroy the bacillus tuberculosis. It is only upon such a supposition that the method of grouping and centralization of phthisis can be explained. The fact, for example, that houses surrounded by consumption will escape for years, would indicate that social relations, such as neighborly acts of kindness, constitute a prominent factor in the spread of the disease, and that without such relations the disease is not ordinarily conveyed. A careful study, moreover, of the early stages of phthisis will satisfy every one that the disease is invariably preceded by some form of indigestion. So absolute is this rule that I doubt whether consumption can occur without a preliminary malnutrition of some kind. I question whether the disease can gain entrance into the body through the lungs, unless possibly by the inhalation of particles of dried pus, and then I think a denuded or inflamed bronchial surface would be required to afford admission to the disease germ. I recently expressed the belief that the bacillus tuberculosis floated about in the air everywhere, and in great numbers. A topographical study of phthisis has shaken that belief. Were that the case, the disease would not be confined to centres, as it is, nor travel so slowly over a given district. I am now of the opinion that the air is inimical to the disease germ, and that the latter only retains its vitality so long as it is protected by the purulent matter in which

it is imbedded, or by congenial extraneous matter. I have no doubt that it will propagate in decaying matter of any kind, and that it can thus perpetuate itself indefinitely. Tubercular pus, however, is the chief source of contagion, and by finding its way into the system with food and drink, spreads the disease slowly, but with the certainty of nature's most infallible law.

It may be well, in conclusion, to answer some of the objections which are raised against the theory of the contagiousness of phthisis. The oldest, and possibly the one that has done more than any other, to obscure the vision of thinkers on the subject, is the fact that nurses in hospitals for consumptives, and physicians treating cases of consumption, do not, as a rule, contract the disease. It was this argument, advanced by the professors of one of the great medical schools of Great Britain,<sup>1</sup> which gave the death-blow to the theory in its infancy in England. It has been the standing argument ever since; and whilst it may have been a strong and proper one at one time, at the present stage of medical science it is so frivolous that, were it not so consonant with general belief and public prejudice, no scientific man would dare advance it. Nurses in typhoid fever and cholera hospitals, and physicians attending upon typhoid fever and cholera patients, do not usually contract those diseases; and yet, who would use that fact as an argument against the contagious nature of those diseases? It must, moreover, be borne in mind that a deranged stomach and some form of malnutrition are essential precursors of phthisis; and that nurses and physicians are usually well-nourished, healthy people.

Another and a very odd objection to the theory is, that consumption does not carry off enough victims for a contagious disease. The persons who raise this objection admit that a great many die of consumption, but they claim that inasmuch as the disease is so widespread, if it were really contagious, it ought to exterminate the human family. Such persons lose sight of the two great laws which keep in check all contagious diseases, and but for which the human family probably would become extinct, namely, acclimatization and exhaustion of proper materials. In some parts of Asia cholera is always endemic and yet the country remains densely populated.

Finally, many are willing to admit that consumption is conta-

<sup>1</sup> The Medical School of Edinburgh, 1793-94.

gious, but they do not think that it is sufficiently so to be taken much notice of, or to warrant governmental interference. They, themselves, have frequently been exposed and have not contracted the disease, and they, therefore, cannot see how it can be very contagious. It is true, that the rich and those in comfortable circumstances have it in their power to escape the disease if they have the wit to do so. But how about the poor? They who, like dumb cattle, are driven by their necessities into the very face of death? Consumption claims most of its victims from that class, and they have neither the power nor the knowledge to escape its clutches. Does not the Government owe them a duty? If consumption is contagious, it can be exterminated, or, at least, its ravages much curtailed; it consequently behooves every government to take up some other position in the matter than one of passive neutrality.

