

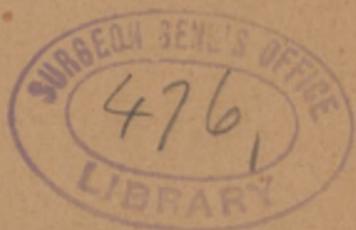
MAYS (Thos. J.)

PULMONARY PHTHISIS IN ITS RELATION TO
INSANITY AND TO OTHER NEUROSES.

BY

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PROFESSOR OF DISEASES OF THE CHEST IN THE PHILADELPHIA POLYCLINIC,
AND VISITING PHYSICIAN TO THE RUSH HOSPITAL FOR CONSUMPTION,
OF PHILADELPHIA.



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DURING recent years I have been devoting a good deal of attention to the study of the nervous nature of pulmonary phthisis, and have latterly given expression to my views on this subject in a brochure entitled *Pulmonary Consumption a Nervous Disease*. In this publication I said all that I deemed necessary to say at that time. Continued research in the same field has, however, not only served to confirm my previous opinion, but shows that a more intimate relation exists between pulmonary phthisis and the ordinary neuroses than I then conceived, so that I have for some time been thinking of gathering the evidence of this relationship for further publication. This I would hardly have undertaken so soon if, in the meantime, there had not appeared a book which, on account of its broad generalizations and scientific deductions, stamp it, in my opinion, as one of the most philosophic works that has been issued from the medical press for a long while. This work is Dr. Clouston's book on *The Neuroses of Development*, and to it must be chiefly ascribed, not only the inspiration and in-

¹ Read before the meeting of the American Neurological Association, New York, June 24, 1892.



centive of what I shall say to-day, but also much of the matter that makes up the body of this paper.

The clinical association between mental diseases and phthisis has been noticed by many authors, among whom are Van der Kolk, Esquirol, Georget, Burrows, Ellis, McKinnon, Clouston, Boyd, Savage, Norman, and others. The illustrious Laennec, who himself fell a victim to phthisis, says (*Treatise on Mediate Auscultation*, Paris, 1822) that he knew of no more certain cause of this disease than profound or prolonged grief or melancholy. From various sources we learn that phthisis is about three times as prevalent among the insane as among the sane, the mortality among the former being estimated at 20 per cent. By some this high death-rate is attributed to the confinement incidental to asylum-life, but this relation is, after all, more apparent than real, for Boyd (*Journal of Mental Science*, vol. xv, p. 196) shows that out of 147 insane that died of phthisis in the Somerset Asylum, there was a slight increase (4.7 per cent.) in the death-rate of the females that were longest confined; while, on the other hand, there was a slight decrease in the death-rate (3.6 per cent.) of the male inmates that were longest confined.

All observers, so far as I am aware, are agreed in the opinion, too, that the insanity is a precursor of the phthisical affection among the insane. This explains why, as Clouston remarks, insanity is not more frequently found in hospitals for pulmonary consumption.

Not only is phthisis more common among the insane than it is among the general population, but facts show that this disease has a predilection for certain forms of insanity. Thus, it is more likely to occur in the depressed than in the exalted types

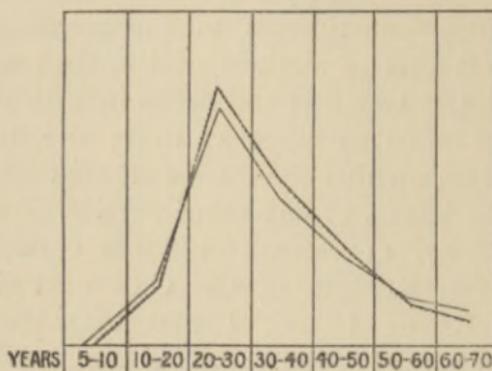
of insanity. Clouston says that this is especially true of melancholia, when combined with the monomania of suspicion, and that sooner or later nearly all these cases die of pulmonary phthisis. Riva and Sulphide (*London Medical Record*, 1879, p. 479) also state that phthisis is more common in melancholia than in any other form of insanity; but it is also found in general paralysis, or parietic dementia, for Sir J. Crichton Browne (*Brain*, vol. vi, p. 317) states that phthisis existed in 25 per cent. of cases of general paralysis examined after death. My own observation leads me to believe that general paralysis, or parietic dementia, is not infrequently associated with phthisis. This opinion is based on an analysis of the statistics of the Department of the Insane in the Philadelphia Hospital, which was made with the assistance of my friend, Dr. Charles Wirgman.

The Ages of Greatest Prevalence of Pulmonary Phthisis and Insanity.—The most superficial examination of mortality-statistics makes it clear that the human constitution is more vulnerable to phthisis at certain periods of life than at others, although it is true that those who inherit the disease die three years earlier than those who acquire it. This is true, whether the disease affects the lungs, the brain, the bones, or any other portion of the body. Thus, in 17,711 cases of phthisis collected from the Health Reports of the City of Philadelphia and of Rhode Island, I find that the greatest mortality among these prevailed between the ages of twenty and thirty. In regard to tuberculous meningitis, Dr. James shows (*Pulmonary Phthisis*, p. 4) that the percentage of deaths from this disease is the heaviest in the twelfth month of infancy, and sinks to a minimum after the third year.

Turning now to an inquiry into the morbidity-rate of insanity, we find that this condition not only pursues a similar course in regard to periodicity, but that this periodicity corresponds precisely with that of pulmonary phthisis. Thus, James (*Ibid.*, p. 41) shows by a curve based on 3985 inmates of the Morningdale Lunatic Asylum of Scotland, that the greatest number of lunacy cases develop between the ages of twenty-five and thirty-five. The *Report of the Pennsylvania Hospital for the Insane*, for the year 1888, gives the ages at which insanity first appeared in 9543 patients, and showing the greatest prevalence of insanity to be between twenty and thirty years.

I have constructed a chart, showing the prevalence of phthisis and insanity at various life periods, in the total number of cases reported in the statistics quoted, and from this a comparative view of the course of the two diseases is readily obtained:

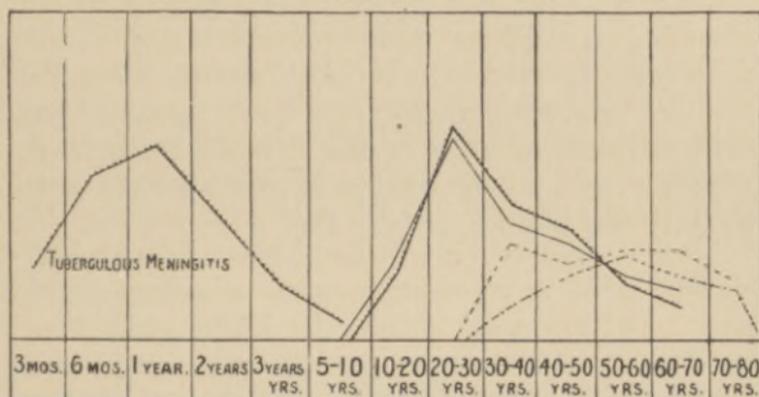
FIG. 1.



The comparative courses of pulmonary phthisis and insanity at various stages. The dotted line represents the curve of pulmonary phthisis or consumption, and the solid line that of insanity. The cases of pulmonary consumption on which the dotted line is based, numbering 17,711, are derived from the sources indicated. The cases of insanity on which the solid line is based, numbering 9543, are obtained from the *Report of the Pennsylvania Hospital for the Insane*, for 1888.

A most interesting feature is brought out in this connection, if the various ages at which tuberculous meningitis mostly flourishes are contrasted in a graphic manner with those at which pulmonary tuberculosis and insanity are most prevalent, as will appear from the accompanying representation.

FIG. 2.



- 1. ----- Phthisis.
- 2. ————— Insanity.
- 3. - - - - - Chronic Nephritis.
- 4. - - - - - Carcinoma.

From this it will be seen that tuberculous meningitis affects early infancy almost exclusively; that pulmonary consumption and insanity occur at a time when tuberculous meningitis ceases to occur, and pursue a parallel course throughout their continuance. The significance of these curves will receive interpretation when the influence of development in the etiology of disease is considered.

The Influence of Heredity in the Causation of Pulmonary Consumption and Insanity.—That the neurotic tendency breeds pulmonary consumption in the offspring has been recognized since the days of Moreau. Hysteria, chorea, epilepsy, etc., are often intermingled with pulmonary consumption in different generations of the same family. The same

is true concerning insanity. Clouston (*Neuroses of Development*, p. 91) tells us that pulmonary consumption and insanity are common in different members of the same family, and a tuberculous heredity may determine insanity, and *vice versâ*.

Dr. James, in referring to the subject of heredity, states (*Pulmonary Phthisis*, p. 109) that "If we compare phthisis with diseased conditions which all observations show are quite independent of micro-organisms, as insanity, very close resemblances are found." He, furthermore, says that Thompson has demonstrated the truth of this (*Family Phthisis*, p. 132) by comparing smallpox and syphilis with insanity and phthisis as follows :

	Smallpox.	Syphilis.	Insanity.	Ph thisis.
<i>Transmission.</i>	Through mother only.	Through either parent.	Through either parent.	Through either parent.
<i>Time of appearance.</i>	Closely on disease in mother	Closely on disease in parents	Not always closely on disease in parents	Not always closely on disease in parents
<i>Protective or not.</i>	Is protective.	Is protective.	Is not protective, but predisposing.	Is not protective, but predisposing.
<i>Atavism</i>	Unknown.	Unknown.	Rather frequent.	Rather frequent.
<i>Ultimate effects.</i>	Extinction of the disease.	Extinction of the disease.	Extinction of the family.	Extinction of the family.

Commenting on these phenomena, Dr. James declares that "here the resemblance between phthisis and insanity is as complete as is their distinction from smallpox and syphilis, and this comparison indicates that whilst such diseases as smallpox and syphilis must be looked upon as being the results of some foreign growths implanted in the body, as in a soil, and there passing through the various stages of

their life-history, insanity and phthisis may be regarded rather as being the results of some peculiar modification of the body itself, the nature of which we do not understand, but which we vaguely term deficient vitality."

Asthma and Pulmonary Phthisis. — Although asthma is a well-recognized disease, its life-history has not been investigated with the thoroughness that its importance demands. This is particularly true with regard to the tendency through which it produces death. The question then is, Of what do asthmatics die? Do they die of asthma, or of some other disease, and if so, what is the relation between the asthma and the disease of which they die? Asthmatics are supposed to be long-lived, but of this I cannot find any corroborative evidence, either in the experience of others or in that of myself. I do not refer to those exceptional cases that undergo spontaneous cure in the later years of life, but to those in whom the attacks incline to become continuous as life advances. Text-books on the practice of medicine, and even most of the special treatises on this subject give no satisfactory answer, but evidence can be gathered to show that asthma naturally develops into pulmonary consumption. Fuller (*Diseases of the Chest*, 1862) states that, in spite of the belief that asthma and pulmonary consumption are antagonistic, many asthmatic patients die of the latter disease. Williams (*Pulmonary Consumption*, 1887, p. 317), in tracing the origin of 385 cases of pulmonary consumption, shows that seven began with spasmodic asthma. On page 61 of the same work he says that the tendency of asthmatic parents to have tuberculous children is hardly sufficiently recognized. James (*Pulmonary Phthisis*, p. 57) asserts that asthma and whooping-

cough are likely to predispose to or terminate in pulmonary phthisis. In my own experience I have seen four cases of asthma that developed into pulmonary consumption, and of these two died. It appears that the danger of asthma lapsing into pulmonary consumption only begins when the attacks of the former follow in such close succession that the irritation produced by the preceding paroxysm has not had time to subside; this is not the case when the attacks recur after long periods of intermission. It seems, therefore, that it is more or less an accumulation of the effects of asthma that develop the phthisical state, the danger of which is averted when sufficient time elapses between the attacks for these morbid effects to pass off.

These facts tend to demonstrate, then, that asthma is closely associated with consumption on the one hand, and I think the instances that follow will make it clear, too, on the other hand, that asthma is closely related to insanity. Clouston (*Neuroses of Development*, p. 65), after defining asthma as a neurosis of the pneumogastric center, says that it often disappears, and is superseded by other nervous diseases, and that its alternation with mania, chorea, and hysteria, is quite common. On looking up the subject of the alternation between asthma and insanity, I have found a number of additional cases to those related by Dr. Clouston in his various writings, and, on account of their great interest, I shall present a short abstract of them.

CASE I.—(Kelp, *Zeitschrift f. Psych.*, xxix, 4.) M., a male, twenty-eight years old, with a family history of insanity on both sides, became asthmatic at twenty-one; he took large doses of morphine and chloral. After some time the asthma disappeared entirely, and was superseded by mania. He pre-

sented extreme depression and anxiety, amounting to desperation, accompanied by a delusion that he was being poisoned. After a time the asthma reappeared, and the mental condition gradually improved.

CASE II.—(Dr. Lorent, *Ibid.*) A male adult, who had long suffered from asthma, fell ill of melancholia, when his chest-troubles vanished. Nine months afterward he recovered from the mental affection, and the asthma returned. A year after this the chest-troubles disappeared again, and the melancholia recurred.

CASE III.—(Dr. H. B. Nunemaker ; private communication.) A male, fifty-five years old, presented paroxysmal mania for about four weeks, when attacks of spasmodic asthma came on, and displaced the mania. These alternations occurred once in about eighteen months, and took place three times while the patient was under observation.

CASE IV.—(Dr. J. C. Stevens ; private communication.) An intemperate male adult was asthmatic for ten years, after which he became insane. He had various delusions, and was subject to paroxysms of abuse and excitement. Occasionally, in the midst of these, an attack of asthma, lasting for a few days, would come on. At these times he was apparently sane. After the asthma disappeared, the mania returned. Finally, the asthma became more or less constant, and the patient remained sane.

CASE V.—(Conolly Norman, *Journal of Mental Science*, vol. xxxi, p. 1.) A female, forty-five years old, suffered from asthma for twenty years. Three months before she came under observation her asthma ceased suddenly, and she became restless, anxious, and melancholic. In two and a half years her asthma returned, but her mental condition did not improve.

CASE VI.—(*Ibid.*) A male, thirty-two years old, had asthma from childhood. The asthma ceased, and he became gloomy, irritable, and was haunted

by the thought that he was to kill his mother. A fortnight after admission to hospital he had an attack of asthma. He at once improved. He became cheerful, the asthma recurred frequently, but his mental condition remained undisturbed.

CASE VII.—(*Ibid.*) A male, about twenty years old, had asthma for some time before he became insane. After being confined in an asylum for three years he became perfectly calm, and the asthma returned; from this he suffered for years. The asthma was not observed when he was maniacal.

CASE VIII.—(*Ibid.*) A female, at the age of thirty, became asthmatic, and suffered until she was about forty, when, on account of some financial distress, she became insane—suffering from delusions of suspicion. After about six months' seclusion, her mind cleared up. During this time she had no asthma. Her asthma returned, but so far as known she had no recurrence of insanity.

CASE IX.—(*Ibid.*) A male, thirty years old, had been a sufferer from asthma for many years. Two years before admission to hospital the asthma became less severe, and his friends date his insanity from that time. After being confined for a year or more, his mind gradually cleared up, and the asthma returned in a severe form. The chronic, calm condition of partial dementia was well established before the onset of the asthma, and the mind remained unchanged.

CASE X.—(Clouston, *Neuroses of Development*, p. 122.) A female became asthmatic at thirteen years of age. At thirty-seven she became melancholic, with delusions, and the asthma ceased.

CASE XI.—(*Ibid.*, p. 24.) A boy, one year old, had an attack of infantile paralysis, followed by impairment of growth of the bones and muscles, with weakness and contracture of the right arm, and lameness of the right leg. At puberty he became asthmatic; at nineteen the asthma ceased, and he had a severe attack of melancholia, attended with excitement. This lasted for six months, before and

during which time he became thin and anemic. As the melancholia passed off the nutrition improved, and the asthma returned.

Commenting on this case, Dr. Clouston says: "What was the significance of the asthma—a spasmodic explosive condition, probably, of the pneumogastric centers—coming on at puberty, and of the excited melancholia at nineteen? Why were the lower and nutritive centers affected first, during the most active period of growth?—and then the respiratory centers?—and then, in order, the mental centers during the reproductive and higher mental development? And why did the asthma cease when the melancholic attack came on? Why was there a failure in the nutritive power of the whole body, as seen by the loss in weight and want of appetite before the melancholia began? Why did he recover from the melancholia instead of passing into dementia, as so many cases of adolescent insanity do? Why did the asthma return? Did its return save him from dementia?"

Although the phenomenon is less frequent and less pronounced, yet there is evidence to show that it is possible for a similar interchange, or at least a transmutation, to occur between insanity and phthisis as there is between insanity and asthma, as is attested by the following short histories:

CASE I.—(Dr. Ray, *American Journal of Insanity*, 1862, vol. xix, p. 40.) A female presented symptoms of pulmonary disease, and soon after cerebral symptoms. She became so excited that she was sent to an asylum. The excitement abated under treatment, and she went home as rational as ever, but the pulmonary disease returned, and she subsequently died of pulmonary phthisis.

CASE II.—*Schmid's Jahrbücher*, suppl., 1847,

p. 72.) A male, twenty-five years old, made a slow recovery from pneumonia. In the following year all objective signs of the pulmonary disease had disappeared. He then became melancholic, and his head was turned spasmodically to the right. He finally died with dyspnea and dysphagia. On examination his brain was found congested and edematous, and there was a cavity in the apex of the right lung.

CASE III.—(Dr. Edward N. Brush ; private communication.) A female, twenty-one years old, became melancholic, and received asylum treatment for nine months. During this time she improved, and became perfectly rational during the last three months of her hospital-residence. There was now observed an evening rise of temperature, and an infiltration at the apices of the lungs. She rapidly sank from consumption, but there was no recurrence of melancholia.

CASE IV.—(*British and Foreign Med.-Chirurg. Review*, lix, 59, p. 117.) Dr. Vosin relates the case of a female who, after suffering from melancholia, with stupor, for four years, was attacked with pulmonary consumption but recovered from her insanity.

These cases give still further proof of the close alliance between insanity and pulmonary phthisis.

Idiocy and Phthisis.—Of all the nervous diseases none is more frequently associated with pulmonary phthisis than idiocy. Indeed, this intimacy is so strongly maintained that one is tempted to be skeptical until the statistics on the subject are fully examined. Thus, Dr. Langdon Down, physician to the Earlswood Asylum for Idiots, says (*Mental Affections of Childhood and Youth*, p. 221), that “the statistics of London show that the deaths from phthisis constitute 115 per 1000 of the general mortality. My notes of the causes of death

at Earlswood indicate that phthisis was the actual cause of death in 398 per 1000 of the general mortality. . . . I have made an analysis of the last hundred of my post-mortem records, and I find that no fewer than 62 per cent. were subjects of tubercular deposit. . . . In several of the cases included in the above record, most careful inquiry failed to discover any family history of tuberculosis. . . . In these cases the tuberculosis appears to have been the sequence of idiocy. . . . Defective innervation, in all probability, led to malnutrition, and predisposed to a tubercular condition. . . . On the other hand, in a large number of cases the progenitors had also manifested a tubercular condition; and in some the tuberculosis of the parents had been, in my opinion, the prime cause of the idiocy of the offspring."

Dr. Isaac N. Kerlin, Superintendent of the Pennsylvania Institution for Feeble-minded Children, in an essay on the Classification and Causation of Idiocy (*Transactions of the Pennsylvania State Medical Society*, 1889, vol. xiii, part i, p. 161), states that "the tables presented with this paper, if prepared by a special advocate to prove that consumption is the main factor in the generation of idiocy, could not be more startling. As they are the result of careful inquiry, without any theory to prove or disprove, I ask for them your respectful judgment in this, as in other details which they present."

In the table to which he refers he gives the histories of 100 families, in each of which there was a case of idiocy. A careful examination of this table shows that 145 members of these families, including parents, sisters, and brothers, and grandparents, were afflicted with pulmonary consumption, 25 with insanity, and 21 with epilepsy. Dr. Down (*op. cit.*,

p. 190) contributes the histories of 20 families, each of which was burdened with idiocy, and among the parents, sisters and brothers, grandparents, uncles and aunts, there were 35 who suffered from pulmonary consumption, 10 from insanity, and 3 from epilepsy. The great prevalence of pulmonary consumption among families that contain idiots is, however, no more startling than is its prevalence where hysteria exists. Thus, Professor Grasset (*Brain*, vols. vi and vii) found that among the parents, brothers and sisters, grandparents, and uncles and aunts, of 44 hysterical patients, there were 60 that were phthisical, 5 insane, and 2 epileptic. In order to grasp the enormous mortality from pulmonary phthisis among the members of families burdened with these neuroses, let us compare their death-rate with that which obtains among the members of families believed to be in good health, with no special predisposition to nervous disorders. Thus, if we take in order 1000 applicants for life-insurance (all not insured, for a number of these were rejected) as they are entered on the record-book in a life-insurance office, as I have done, we shall find that among the members of their families only 176 were consumptive, 9 insane, and 4 epileptic. By tabulating these figures in percentages, *i. e.*, by obtaining the proportion between the members of each hundred families represented and the number of sufferers from pulmonary consumption, insanity, and epilepsy, the contrast between the normal and the abnormal will be brought out in a most striking manner.

A comparison of these figures demonstrates that the death-rate from pulmonary tuberculosis is from eight to ten times as great among families of the neurotic class as it is among those of the healthy

population. Not only is this an enormous death-rate, but, from further inquiry, it appears that, at least among the idiotic class, pulmonary consumption occurs earlier in life than it does among the general population or among the insane. Thus, it has been demonstrated that the greatest general mortality of consumption takes place between the ages of twenty and thirty; but in Dr. Down's record of 80 idiots that died of phthisis, the highest mortality-period is between ten and twenty years, showing that congenital or infantile disease of the brain and nervous system is capable of causing the greatest mortality-period of pulmonary consumption to appear ten years earlier than it otherwise would.

Among parents, brothers and sisters, grandparents, uncles and aunts of	Phthisis.	Insanity.	Epilepsy.
	Per cent. ¹	Per cent.	Per cent.
1000 life-insurance applicants .	17.6	0.9	0.4
Dr. Kerlin's 100 families that produced idiotic children (aunts and uncles not included) . .	145	25	21
Dr. Down's 20 families that produced idiotic children . . .	175	35	15
Prof. Grasset's 44 families burdened with hysteria	136	11.36	4.50

¹ As already defined.

In concluding this interesting chapter on idiocy, Dr. Down states: "It appears to me that tuberculosis must be accepted as one important cause of idiocy; that it impresses special characters thereon which impart a strong family likeness to the subjects of this class. It is no less clear to me that idiocy of a non-tubercular origin leads to tuberculosis. Whether this arises through the influence of the pneumogastric nerve, mal-assimilation of food, or

defective innervation, it cannot but be regarded that the connection between these two maladies is by no means accidental, and that a due appreciation of this relation is necessary to those who would treat effectively congenital mental lesions."

Now, what interpretation can be given to these facts? Only one, so far as I can see, viz., that pulmonary phthisis and insanity belong to the same family-group of diseases. In order to comprehend this statement in its fullest extent, it must be borne in mind that that period in the life of an organ during which it undergoes development, either in structure or in function, marks a crisis in its history, and is the time when it is especially susceptible to disease. This point is particularly insisted on by Dr. Clouston, and it is in perfect accord with physiologic law. He holds that all true cases of epilepsy arise almost exclusively during the growth and development of the brain. The first period is that of the most rapid brain-growth—from birth to seven years of age—and the second is that of slow brain-growth, but rapid development, the early reproductive period, from thirteen to eighteen years of age. In the great majority of instances chorea occurs between the ages of six and fifteen, the period of life when motion and emotion become coördinated. Megrin is a sensory neurosis that almost never appears before seven, or later than twenty-five years of age. According to James, tuberculous meningitis is comparatively infrequent during the first months of life, reaches its maximum about the end of the first year, and then declines rapidly; the maximum, in all probability, corresponds with the time when the trophic and organic functions of the brain are most actively evolved.

The greatest prevalence of insanity—which is

between twenty and thirty years—does not correspond with the maximum development of the structure of the brain, for this, as has been stated, takes place before the age of seven, and practically ceases at the age of twenty-five. It does tally, however, with that period in life at which the brain and nervous system undergo the most varied, intense, and complex development in function; for between twenty and thirty a new vista is opened to man. It is the period in which he is compelled to face untried and unsolved problems. He is removed from paternal protection, and left to struggle for his own existence in the battle of life. He becomes burdened with family cares and duties. He is exposed to overwork, business vicissitudes, mental anxiety and perplexities, domestic troubles, grief, disappointment, vicious habits, indulgences, intemperance, syphilis, and many other pernicious influences—influences that, by operating on a brain of either inherited or acquired instability, are known to be among the most prolific causes of insanity.

Pulmonary consumption, on superficial inspection, has apparently nothing, in a pathologic sense, in common with insanity, but on deeper examination the former proves to be a perfect analogue of the latter. Phthisis manifests itself during the developmental, and not, like carcinoma and chronic nephritis, during the degenerative period of life, and causes one-seventh of all of the deaths among the human race. It has been shown that the other diseases that arise during the corresponding period do so by reason of some structural or functional change in the organs affected, as a result of which susceptibility of these organs to disease is increased. Is this true of the lungs, in so far as they stand related to phthisis? Clouston is inclined

to the opinion that there is present a trophic disturbance of development of the alveolar epithelium at the age at which phthisis is common, as a result of which a nidus is created for the lodgment and propagation of the tubercle-bacillus. With deference to this high authority, I am constrained to differ with him on this point. It is well known that the alveolar epithelium appears to be of a hybrid character, that it is most unstable, and has a much greater inherent susceptibility to disease during infancy than during any subsequent period; but so far as I am able to discern, there is no histologic or physiologic evidence to show that any development occurs in this structure at the time when pulmonary phthisis predominates; nor is there any proof that the lungs, as a whole, undergo growth in any respect during adult life. There being no such changes detectable in the respiratory organs, or in any of their component tissues, excepting in their nerve-supply, it becomes pertinent to inquire whether pulmonary phthisis is not primarily due to nerve-degeneration, and whether there is proof to substantiate this proposition.

Notwithstanding the great advance in the modern study of the neuroses, the pathologic relationship between the lungs and their nerve-supply has been practically ignored. The lungs are innervated by the largest and most important nerves in the body; yet, strange to say, nearly all of the diseases incidental to these organs are at present attributed to the influence of irritants and excitants introduced from without, and the possibility that the fault may reside in this nerve does not even receive serious consideration. It is not so in disease of other organs. When, for example, an arm or a leg refuses to perform its function, or fails in its nutrition, im-

mediate inquiry is directed to the state of its nerve-supply. In disease of the eye, the condition of the optic nerve is carefully investigated. Inflammation and ulceration of the skin and subjacent tissues are known to be frequently due to disease of, or injury to, the nerves that supply these parts. A multitude of other instances might be given to illustrate the close dependence of the diseases of many organs on lesions of the nervous system.

Experiments, almost without number, demonstrate that section of, or injury to, the pneumogastric nerves of animals, is followed by degeneration of the lungs, as manifested by edema, hyperemia, splenization, hemorrhages, and emphysema—in fact, all of the elements of catarrhal or cheesy pneumonia. Professor Schiff, who has been largely interested in this subject, succeeded in developing both hepatization and tuberculization in the lungs of rabbits by irritating and injuring the pneumogastric nerves. In a series of experiments with rabbits, by wrapping the pneumogastric nerve of one side in cotton-wool saturated with glycerin, replacing it, and stitching the edges of the wound together, I found that hepatization developed in every case, associated in one instance with yellow tuberculization.

It is true that this condition is known as "Schluck" pneumonia, implying that it is brought about by the entrance of mucus and particles of food into the trachea and bronchi of animals, in consequence of the paralysis of the pharynx and larynx produced by the operation. This view does not, however, seem to be correct, for Aruspberger (*Virchow's Archiv*, vol. ix, pp. 197 and 437) has shown that if, after section of the nerves, a tube is inserted in the trachea, and the admission of foreign

bodies into the lungs is prevented, the same pulmonary changes occur.

It is not necessary, however, to appeal to experiments on animals alone, in order to demonstrate that lesions of the pneumogastrics are capable of producing lung-disintegration, for there are many instances recorded in which pulmonary consumption in the human subject resulted clearly from disease of these nerves. In my brochure, already referred to, I submit the histories of eighty-one cases of pulmonary consumption associated with demonstrated disease of the vagus. In every instance these nerves were either compressed by aneurisms, enlarged glands, tumors, etc., or interfered with by other causes; and while it is hard to establish the fact that the lung-disease followed the nerve-lesion in every instance, this was undoubtedly the sequence in the vast majority of cases. In discussing the anatomic aspects of two of the cases included in my list, the late Sir William Gull referred to this very subject in the following language: "These cases afford an excellent illustration of the effects which are referable to paralysis of the pulmonary plexus on one side, accumulation of muco-purulent secretion in the paralyzed bronchi, subsequent dilatation of the tubes at their peripheral distribution, concomitant exudation into the air-cells, hepatization, and at length disintegration of tissue on the other.

. . . It is one of the evils of a too exclusively humoral pathology (1859) that leads us to overlook the minute anatomical relations of disease, which are in themselves often a key to the sequence of morbid changes. These cases illustrate this proposition, for the possible local effects on the lung of injury to the pneumogastric and pulmonary plexus being recognized, whenever cause for that injury

exists we may anticipate its results, and are not wholly dependent upon physical examination, as we are if we limit our pathological view to the mere changes in the lung, without considering how they are produced."

In making comments on one of his cases, to which I also refer in my list, Dr. Wilks, of London, expresses himself in a similar strain when he says: "It has been said that the patient died of phthisis, and the tumors were found accidentally; but, in all probability, the affection of the nerves—that is, of the pneumogastric—was the cause of the pulmonary disease, and, therefore, so far from neuroma being a harmless affection, it was the cause of the girl's death. This idea was suggested by the observation of several other cases of lung disease occurring in connection with disease of these nerves, particularly as witnessed in aneurism of the aorta and cancer of the esophagus. In these diseases death is often brought about by the pulmonary affection, and the pneumogastric nerves are found implicated in the disease, or pressed on by the tumor."

A brief analysis of my recorded cases develops the fact that twenty-nine show, as clearly as anything can be shown, that the phthisical degeneration was the result of a primary local disorganization of the vagi, due to the pressure of aneurisms, tumors, enlarged glands, etc., on these nerves. Here we possess all the requirements and conditions of a perfect experiment, such as we aim to secure in animals; and, unless we assume that pulmonary consumption preceded the local pressure on the vagi—a view that is not confirmed by anything that appears in the histories of the cases—we are bound to accept the proposition that phthisis is a direct sequence of disease of the vagus. In twenty

other cases disease of the vagus and pulmonary phthisis were associated with various nervous affections, such as multiple neuritis, tabes dorsalis, bulbar paralysis, etc., and in each of these there is every reason to believe that the pulmonary lesions were secondary to disintegration of the vagi. In eighteen others it is shown that pulmonary consumption was the result of disease of the vagus engendered by the pernicious influence of alcohol and syphilis. In fourteen other cases pulmonary consumption and disease of the vagus were associated with diabetes and epilepsy. In my brochure I also tabulate the histories of sixty cases in which pneumonia, bronchitis, etc., coëxisted with well-ascertained disease of the vagi. Moreover, Drs. Bianchi and Armandi (*Neurolog. Centralblatt*, 1884, p. 452) found the vagi diseased in eleven paralytics that had died of pneumonia; and Dr. Bianchi, in a more recent contribution to this subject (*Neurolog. Centralblatt*, 1890, p. 249), states that in a number of paralytics, that had died of pneumonia, he was able to trace a primary degenerative atrophy of the vagi, and hence he believes that these pneumonias are dependent on degeneration of the vagus. He does not believe that they are induced by the swallowing of particles of food (*Schluck pneumonie*).

Here, then, is a record of 152 cases, in most of which disease of the vagus preceded pulmonary phthisis, or some other form of pulmonary disease. It may be urged, however, that in view of the general or local disease of the nervous system that coëxisted in these cases, there was reason to anticipate a lesion of the vagus, and the question may arise whether, in the ordinary form of pulmonary phthisis, not associated with any overt disease of the nervous system, a similar condition is found

in the vagus. It seems to me, however, that this objection is more apparent than real, because all that the nervous origin of pulmonary phthisis demands is a showing that disease of the vagus is capable of engendering consumption regardless of whether this takes place in connection with well-recognized general nervous disease or not—I say with well-recognized nervous disease, for I am fully convinced that the majority of phthisical patients, if closely observed, would be seen to manifest well-defined symptoms of nervous disease. This opinion is substantiated by the pathologic research of Dr. Jappa (*Neurolog. Centralblatt*, 1888, Bd. vii, p. 425), who examined the peripheral nerves in the bodies of fifteen persons dead of pulmonary phthisis, and found marked degeneration in every case. He states that in these patients there were no nervous symptoms during life, except such as are found in almost all cases of the kind, as undefined muscle-pains, neuralgia, hyperesthesia, etc. Aside from all this, however, the testimony that I have been able to gather on this point demonstrates that the vagi are diseased in those phthisical subjects which are examined after death. Thus, Dr. Lewin (*Beiträge zur Pathologie der N. Vagus*, 1888), in a minute study of the ganglion of the trunk of the vagus in twenty cases of pulmonary tuberculosis, found it degenerated in every instance.

The foregoing facts, figures, and inductions establish, I think, the truth of the proposition that the link that binds pulmonary phthisis to insanity and to other neuroses is disease of the vagi. This connection furnishes a key to the problem why pulmonary phthisis, a developmental disease, should occur in organs that undergo no development at the time of greatest prevalence of the disease. It also

shows why asthma should naturally be transformed into pulmonary phthisis; it furnishes the reason why pulmonary phthisis is at least three times as common among the insane as among the sane; and why it is about eight or ten times as prevalent among families burdened with either idiocy or hysteria in some of their offspring, as in those not so burdened. Indeed, this is precisely what the theory predicts and demands. It does even more than this. It explains why idiots die of pulmonary phthisis ten years earlier than healthy persons. This is accounted for by the fact that a depraved brain and nervous system, such as obtain among this class of unfortunates, offer less resistance to disease than a healthy brain and nervous system. On the same score it accounts for the fact that those that inherit pulmonary phthisis die three years earlier than those that acquire it. It offers at least a partial solution to the question why pulmonary phthisis is more prone to show itself in the insane, than is insanity to show itself among the phthisical. Insanity is an affection of the highest nerve-centers, and pulmonary phthisis, if this is granted, is an affection of the respiratory, and hence of the lower centers; pathology teaches that, as a rule, disease of the higher nerve-centers is more prone to implicate the lower centers than is disease of the latter to implicate the upper. The same law holds true of other neuroses. There are, for example, choreic and hysterical insanities; yet comparatively few choreics and hysterics are insane. Locomotor ataxia is associated with paresis, yet few typical ataxics suffer from insanity.

The view advanced furthermore explains why pulmonary phthisis is excited by many of the influences that give rise to insanity. In the differ-

ential etiology of pulmonary phthisis and insanity it appears that less depends on the nature and character of the causes than on the susceptibility of the organism on which they operate. For example, it is conceivable from what we know of this subject that the cause that gives rise to pulmonary phthisis in one individual may, by acting on another with an innate tendency to nervous or mental disease, generate asthma, hysteria, or insanity, and possibly pulmonary phthisis subsequently. So, in the same way it interprets why the age that is most productive of pulmonary phthisis should be between twenty and thirty. It is well known that grief, anxiety, disappointment, excessive mental and physical strain, alcoholism, syphilis, and excesses of all kinds are as potent factors in the production of pulmonary phthisis as they are of insanity. When man attains the age of twenty-five he falls a victim to pulmonary phthisis, not because there is a developmental change going on in his lungs, but because new functions have to be developed to assist him in adapting himself to another mode of life. He is confronted by civilization, with its education, knowledge and inventions; its diverse manners and customs; its changeable institutions; its rankling politics; its innumerable arts, sciences, and manufactures; its multiplicity of industries and employments; its burning life-struggles; its accompanying proneness to vices, excesses, and abuses of all sorts—all of which demand of him the exercise of the highest attainable mental qualifications in order to attain its standard and preserve his well-being. He is like an animal on which are imposed new conditions incidental to a succession of geologic changes, and to which it must adjust its organization in order to maintain its existence. His new

environment is not of the same character as that of the animal, but its power is just as real and as great. The brunt of the battle at this time falls principally on his brain and nervous system, for they are the instruments through which he adapts himself to his new relations; and if from any acquired or inherited weakness these prove inadequate, he will fall in the combat.

In view of these premises, it is not to be wondered at that any influence that impairs the efficiency of the nervous system, no matter whether it is a mental or a physical strain, whether syphilis or poisoning from alcohol, mercury, lead, or brass, whether the virus of diphtheria, measles, scarlatina, whooping-cough, influenza, etc, will also be productive of pulmonary tuberculosis; although we must not overlook the fact that the disease is also generated by auto-tuberculous infection, by traumatism, and by the inhalation of stone-dust, and other particles of matter; nor is it surprising that those that are already burdened with a neurotic taint should go down first, and in the largest numbers; nor need we be astonished to learn that the aborigines of North America, Australia, and New Zealand are being decimated and exterminated by pulmonary phthisis in their unequal warfare with modern civilization.

I think that we are justified in concluding, then, that in genesis and in nature, pulmonary phthisis is so closely related to insanity and to the other neuroses that it may be regarded as one of the branches of the family tree to which they belong. In spite of the fact that occasionally there may be alternation or transmutation between these diseases, thus emphasizing their specific alliance to each other, we must bear in mind that there exists a con-

stant and living difference between all of them. An individual does not become phthisical, insane, epileptic, idiotic, or asthmatic as a result of indifferent material and conditions, but because the inherited influences combine with the exciting causes in his environment and predetermine the variety of his affection; and so long as these remain constant, that long will his disease remain typical. No one is more conscious than I am of the imperfections and shortcomings with which the neurotic theory of pulmonary tuberculosis is here presented; and in order to compensate for this deficiency I shall, in closing, quote the pertinent and philosophic remarks of Dr. Clouston on this subject: "The coincidence of the maximum age of tubercular lung infection, and of greatest liability to one of the most important of the acquired insanities, that of adolescence, is a very striking fact, and taken together with the facts as to heredity, seems to show that if tuberculosis cannot itself be called a neurosis, it is in most cases dependent for its existence on a trophic neurosis, or has the closest affinity to it" (p. 92).



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