S. S. Aconcagua
at Rio de Janeiro
22 March 1884.

To the Dean of
The Medical Faculty
of the University of Edinburgh

Sir,
Herewith please find my Thesis which I submit to the judgement of the Faculty for the obtaining of the degree of M. D.

I hereby certify that the enclosed Thesis has been entirely written by me, and that I have been engaged in the practice of my profession as a physician and surgeon for more than four years, two of which I passed in Wales, and two in the service of the Pacific Steam Navigation Company, and that I am prepared to produce evidence and the necessary certificates of having passed all the examinations necessary to proceed to graduation as an M. D.

I have the honour to be, Sir,
Your obedient Servant,
(William Rowlands,
M. B & C. M. with
Second Class Honours 1879)

of Ebenezer,
Near Carnarvon,
Wales.

An Essay upon
The Nature of Asthma

Submitted to the judgement of the "Medical Faculty" of the University of Edinburgh, as a graduation Thesis, for the degree of Doctor of Medicine, in the year 1884.

by

William Rowlands, M.B.,
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Nr Carnarvon,
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On

The Nature of Asthma.

1. Introductory Remarks.

Much has been written of Asthma & many have been the attempts by many eminent men to account for the phenomena of this disease, where Sir Thomas Watson, Trousseau, Hyde Salter, Sawyer, Lefevre — Williams &c have laboured, each with characteristic zeal and ability, little is left for elucidation. At the same time, in reading what has been written on this subject one cannot fail to be struck with the diversity of opinion which exists, more especially in regard to the Pathology of Asthma. It is the purpose of the writer of the following pages to examine the various theories propounded by different writers at various times, and finally, to propose a theory of the production of some Asthmatic paroxysms, — a theory suggested by the necessity of finding some means of explaining the markedly different theories held by such men as Hyde Salter and Berkart, as well as by the analogy existing between Asthma and other diseases.

2. History of the Inquiries into the "Pathology of Asthma"

Dr Berkart in his work "On Asthma", Chapter 2nd (page 12) presents his readers with a most interesting Chapter on the History of Asthma, and to this author the present writer must at the very outset acknowledge

his indebtedness for many facts he may use in the present chapter, and also for suggestions as to other valuable sources of information.

There is not any particular reason to believe that Asthma is a modern disease. Hippocrates, Galen and Celsus are quoted by writers on the subject as having described it, and although it was easy for them to describe diseases, which we nowadays are enabled to refer to some other organs than the respiratory, yet they ~~must~~ as instances of Asthma, yet any instances of the disease so called by us, observed by them, they would also have so described. The discovery of the stethoscope enabled Laennec and his disciples to explain many of the cases of Asthma, and to refer them to definite morbid organic causes, but it did not enable him to account for the intermittency or periodicity of the disease. The only persistent post mortem condition in Asthmatics was Emphysema. Laennec was inclined to conclude that Asthma was a species of Emphysema with Pituitary Catarrh, and also to grant, though not without some hesitation, the existence of a neuromuscular element to account for its "spasmodic" character. It is this paroxysmal intermittency of the dyspnoea which has been the battle-ground since the days of Laennec. In his "Science and Practice of Medicine" (page 784) Dr. Aitken cannot go further in his definition of Asthma than this, without entering upon debatable matter. "A disease which culminates in paroxysmal attacks of difficult breathing of varying duration." After this we shall

find on the one hand a number of writers who affirm the necessity of a neuromuscular element to account for the "paroxysms", and on the other, others totally denying its necessity and its activity.
Andral (quoted by Berkart), having seen a case of violent dyspnoea which ended in the death of the patient, presenting post-mortem a mass of solid mucus blocking the origin of a large bronchus, remarks that had it not been for the careful examination made, the case would have been looked upon as one of Nervous Asthma, — a disease whose existence he would grant only very reluctantly.
Louis looked upon paroxysmal dyspnoea as one of the early symptoms of Emphysema. Lefèvre, Trousseau, Williams, Longet and most writers maintain the existence of a neuromuscular element; others such as Traube and Villemin consider a "fluxionary hyperaemia" as the cause of the attacks; Weber and Halle consider the disease a "vasomotor neurosis"; while Beau and Hirsch consider a catarrhal state of the lungs post-mortem as a sufficient explanation of a paroxysm.
Hyde Salter enters at length in the first chapter of his standard work into a great many of the most celebrated theories of Asthma held at different times. The occasional transient dyspnoea of such diseases as Chlorosis or Diabetes, or their more permanent or more serious great difficulty of breathing, differs from the dyspnoea of Asthma in character, but the diagnosis of the diseases can always be made out with facility after a short period of observation.
Dr. Bree's theory that Asthma is an extraordinary

effort to get rid of some peccant and irritant matter from the airtubes - is not tenable, because the respiratory result - interchange of air - or possible emptying, are lessened - Against those who maintain that Asthma is the plugging of a bronchus with Bronchitic exudation, it is enough to quote Prof. Gairdner (Med-Chir. Rev. Vol XI) as pointing out the absence of dyspnoea of any note in cases of ordinary Bronchitis where there are much larger accumulations of mucus. Certain specific humoral disturbances may cause dyspnoea either by the alteration of the blood particles, or by exciting the conditions which may give rise to dyspnoea, either in or without the lungs, but Salter points out that Dr. Todd would find it but too difficult to explain all cases of Asthma upon a humoral theory and without the presence of muscular fibres. Dr. Walshe assumes that "Bronchial Asthma may depend on a plus or minus state of the contractility of the muscular fibres of the bronchial tubes; in the former case it is spasmodic, in the latter paralytic." (quoted by Salter). The only power these muscles can have, should assist expiration, but how their paralysis, leaving a pervious tube, can to any great extent retard it, it is, as Salter points out, difficult to understand.

The Prevalent Theory and its Criticism by Berkart.

The great ability and careful reasoning of Salter convinced most people that the theory of Asthma upheld by him was the correct one. His Thesis

is that asthma" is essentially a nervous disease, depending upon spastic contraction of the organic muscles of the Bronchial tubes". The reasons for this conclusion Salter derives from the following considerations - 1. The causes of Asthma, 2., its remedies, 3., its associated and precursory symptoms, 4., its periodicity, 5., the absence of organic change, 6. the circumstance that the phenomena of the disease are muscular. (Hyde Salter pp. 24. 25.). Berkart (l.c. p. 117) looks upon Asthma, as "only one link in a chain of quasi-independent affections, which commences with inflammatory changes of the pulmonary tissue and terminates with Emphysema or Bronchiectasis". In a previous portion of the book he discusses Salter's Thesis (pp. 49 - 109), and it is proposed to follow this criticism, examining its value and fairness.

I. As to whether Asthma is a nervous disease.

1. As to the absence of physical signs.

Berkart points out, quoting Walshe, (a) that the mere existence of certain abnormal physical signs does not warrant the assumption that textural change exists, and conversely (B) that their total absence does not prove the heart to be in a perfect state of organic soundness. He says there are certain physical signs, e.g. "the Asthmatic physique," to which Salter draws great attention, or an undue obesity, while in taking a comprehensive view of the disease, we find among its antecedents, history of lung affection in 90 per cent of the case, and post-mortem and ante mortem evidence of Emphysema in most Asthmatics. Waldenburg has quoted as having found by manometric measurements a relative

diminution of expiratory force in those recently subject to Asthma, implying this pathological condition to be therefore antecedent to the attacks. Salter relies but very slightly upon such an argument as the "absence of the physical signs". He even mentions everything specified above by Berkart - (except the last fact) as being concurrent phenomena or antecedent history. He founds the value of his argument upon the absolute absence of physical signs in some - and even - only a few cases. He states that Asthma attacks persons with no history of antecedent lung disease and in whom no signs of lung mischief can be detected. As to Waldenburg's observations it is desireable to know (1) whether his patients were subjects with a history of previous lung disease, and (2) something about the severity and frequency of the attacks - before we accept the above conclusion.

2. As to Freedom of respiration between the attacks:- "Freedom of respiration is ~~explained~~ consistent according to Berkart, with a diseased state of the lungs because (1) in healthy quiet respiration but a third of the lung surface is "on duty", and (2) the system accomodates itself to the deficiency of oxygen, when there is a deficiency." Freedom of respiration, however, is only consistent with a slight amount of disease, or with none at all.

3. As to Post Mortem Examinations.

A. The Negative Results:- The difficulty about Asthma is really no more than that of inability to account for the paroxysms (and not for any permanent dyspnoea) by the post mortem appearances. Berkart points out that some of the "Negative Results" on record - would nowadays be simply the explanations of Aneurisms, Pulmonary

Embolic. This is very likely, but it cannot be assumed by a modern critic that such errors have been common, especially of late, while it must be admitted that competent Pathologists, in numbers, still consider the disease to be a nervous and even a spasmodic one. Uncomplicated cases of Asthma are confessedly rare and paroxysms are rarely fatal. The presence of Carbonic Acid in excess in the blood seems to overcome the paroxysm, whatever be its cause, before it is fatal. Berkart (l.c) quotes a case from Reinecker, - a case diagnosed as "Bronchitis and Asthma", in which the post-mortem results explained away the mysterious nervous element; these results were - "plugs in the second divisions of the pulmonary artery" and "corresponding thrombi in the right auricle"; also, "chronic Bronchitis, dilated Bronchi, Gastric Catarrh, Fatty liver &c &c". Now, the history of the case was briefly this :- "Admitted into Hospital for severe Bronchitis, which soon became complicated with violent asthmatic seizures presenting the usual symptoms." He now improved from the Catarrh and dyspnoea so far as to be able to follow his occupation; still a slight dyspnoea remained. Soon after he had another similar attack in which "the lungs gave a full and sonorous percussion note and there were a few mucous râles at the base. The cardiac impulse was almost imperceptible, the area of the heart not enlarged and the sounds were not altered". Stimulants and Expectorants caused improvement, but soon, in another protracted attack the patient died. Such a case may or may not be fully explained by the above post mortem results. One might still ask, was there not a spasm superinduced - accounting for

the "Asthmatic" exacerbation of the dyspnoea? or, did not the Bronchitis so injure the bloodvessels as to render them more ~~readily~~ dilatable? &c. Extreme prolonged dyspnoea is not regarded as asthma. Explanation of the paroxysmal exacerbation is what is required — not explanation of a prolonged dyspnoea.

B. The Positive results:— It is claimed, then, by the adherents of the prevalent theory that the post-mortem results do not account for all the phenomena of an asthmatic seizure. Pathological conditions post-mortem in the vast majority of cases — no one denies. Whether derangement of function causes derangement of texture or not, it is true that in Asthma there is a derangement of function causing great distress while it is impossible to diagnose the "derangement of texture" that accounts for it, unless after the persistence of the disease. The so-called "asthmatic physique" is a result of prolonged asthma, and so are the modifications of the bones in the Asthmatic rickety. Emphysema, Congestion, Catarrh &c are frequent accompaniments of asthma, and are found post-mortem. They may be causes of asthma, or they and the asthma may be caused by a common nutritive error, or ~~that~~ Emphysema might even be caused by the asthma, assuming spasm, on Gairdner's "Compensatory" Theory of its production, but their occurrence post-mortem afford no argument for or against a Nervous element in the paroxysm. It is the absence of diagnosable Emphysema &c, in early cases, in severe early cases, which would seem to point to the existence of a Nervous Element.

4. As to the causes of the paroxysm. The capriciousness of a disease is no very strong argument for its Nervous

nature. Still Asthma is capricious in its causes and in the time of its attacks, and it is hardly explained away by the assumption of dust and irritants in rooms, for the same conditions will not always bring on an attack. The lack of oxygen or the excess of the products of combustion of the sources of light in a room will not explain attacks of Asthma. I have known patients to get relief in a crowded theatre or a church. "Cold and wet" are well known irritants, and the discoveries of Blackley as to Penicillium &c in the air are very interesting and explain many cases, but when we find that "predisposition in certain individuals" (Berkart p. 78). must be assumed to account for the effects of ~~certain~~ such agencies, we seem to approach near some "mysterious" if not a "nervous" influence. It may be pointed out also that certain Asthmatics can always experiment on themselves and produce an attack by certain means. A patient of the writer's can always do so by eating of any crustacean, his Asthma being accompanied by an attack of Urticaria, both going away under the influence of Anaesthetics, and it may be remarked in this connection, that those cure Asthma by some other means than helping the Oxygenation and decarbonisation of the blood.

5. <u>As to Treatment</u>. — The fact that Narcotics are the most beneficial remedies in Asthma led Salter to say that this indicated the Nervous Nature of the disease. Berkart points out that they give also the most relief in Pneumonia, Pleurisy &c, and asks if they point out the same thing in them. In these diseases, it must be noted it is the <u>pain</u> they relieve, a nervous element certainly; in Asthma, they relieve the dyspnoea. If again, it be objected, that after the

relief afforded by chloral, the presumed spasm may persist; but that the respiratory wants of the body have been lessened, still, - the relief is permanent; the influence of the drug soon passes away. If there was a spasm, it gave way. Anyhow, the *status quo* was restored.

6. As to Periodicity. - The Periodicity of Asthma, although not of a very definite kind, must be regarded as evidence, *pro tanto*, of a Nervous element. The "clogging of a bronchus with mucus" (Berkart. l.c) explains dyspnoea, but not the nightly occurrence of it, nor, as is often seen, how the dyspnoea comes on during the first two hours sleep, to be relieved, and then to allow of a sleep of several hours, quite free. The nightly dyspnoea will come on even if the patient keeps awake, though it may not be quite so bad.

7. As to the associated and precursory symptoms. - The analogy between Asthma and wellknown Nervous disorders in respect to the above symptoms is dwelt upon by Salter. Its value as evidence of the Nervous Nature of the disease may not be very great, Still, "copious urine" is nearly as characteristic of Asthma as it is of Hysteria; "high spirits" may lead people to excesses and bring on Asthma (Berkart. l.c), but they are wellknown *Epileptic aura* also; and so may "low spirits" be the result of a low nervous depression as well as indicative of arrears of respiration.

8. As to Symptoms. - Berkart (p. 89) quotes a case related by one of Salter's patients to the effect that "the attack ceases on the expectoration of pellets &c" and points that such would be evidence of the pellets having caused the dyspnoea by their very presence in the tubes, and not as Salter maintains that they were imprisoned by the Spasm. The miter by

these papes has always found the relief to precede expectoration considerably, and thus the pellets could hardly have been the immediate cause of the dyspnoea. Granting the presence of mucus before the attack begins, still it may excite spasm by its presence and so bring on the attacks.

Berkart draws attention in a table (p. 90) the difference between the physical signs of attacks of asthma as recorded by different observers, and concludes that the cases are "a promiscuous collection of instances of paroxysmal dyspnoea," and having shewn that ~~those~~ cases of asthma, quoted from Salter and Bergson, were not cases of "primary nervous origin," he concludes that the paroxysms were produced in various ways and under various conditions. Recorded cases of asthma present, as the rule, much the same physical signs, and when we consider the duties of a patient and how difficult this renders a thorough physical examination, it is a cause for no wonder that some discrepancies exist in the records, while it is also probable that some cases of other diseases, difficult to diagnose and not made out post mortem, have been recorded vaguely as asthma. It is the fact, however, that the majority of those who have recorded cases have been biased in favour of the prevalent theory.

In this connection, Salter bases his argument upon the fact that "the phenomena of the disease are muscular," as also in Epilepsy, Tetanus &c, while "the essence of the disease is nervous." (Salter p. 30). It is difficult to conclude otherwise than that the "array of witnesses" produced by Salter stands as affording as conclusive a proof as it is possible to obtain of the nervous nature of Asthma, while in his criticism Berkart

seems to make out only that asthma is a "quasi-indep- disease", often related to various pulmonary and other conditions, and often ending or accompanying Bronchiectasis and Emphysema. This might perhaps be granted by Salter, but he would strongly maintain that the 'quasi-independency' was of a nervous nature.

B. Is Asthma a Bronchial Spasm?

While proceeding to shew spasm to be impossible, Berkart (p. 101 et seq), quotes Schultze as to the presence of the muscular fibres even in the smallest tubes, and Paul Bert to the effect that they are not actively engaged in the respiratory mechanism, but that their function is to resist traction as is that of the muscular fibres in the vascular walls to resist dilatation. In this connection one is tempted to point out that the muscles in the vascular walls can contract even to the obliteration of the lumen of a small artery.

The experiments of Volkmann and Williams are referred to by Salter (p. 35) as the positive proof by direct experiment of what he has been endeavouring to prove by arguments from clinical observations - viz - of spasm. The experiments of Williams, and with them those of P. Bert, are quoted by Berkart (p. 103) to disprove the same inference, because there was no muscular result to the stimulation of the vagus when the lungs were inflated, which is their condition within the thorax normally, and their condition in exaggeration in Emphysema. Still the degree of necessary collapse for the stimulation to be effective is not given, while there may also be a difference in the effect according to whether the cause of the dilatation of

the lungs be external or internal to the bronchial tubes. Berkart further affirms that the "clinical features of the asthmatic paroxysms afford abundant evidence against that theory", calling attention first of all to the "improbability that muscles could remain uninterruptedly contracted for days and weeks together" — a thing it is quite unnecessary to suppose in order to account for a paroxysm lasting two days and one night; it is simply supposed that some fibres are contracting and many ready to contract at the call of the nervous stimulus.

(a) Among the physical signs we find "Inspiration is relatively easy, while respiration is laborious and ineffective". "The bronchial muscles, if of any service should assist the latter!

(b). If the spasm oppose expiration, it would have to oppose the powerful forces of expiration

(c) If it be equally opposed to both inspiration and expiration, why does the less powerful succeed?

Hyde Salter (p. 79) and Berkart (105-pp-106) both go into the above questions. Salter answers the last two positions by stating that "he believes expiration to be actually though not potentially weaker than inspiration, — that it has the power in reserve, but does not make use of it. Inspiration is normally muscular; expiration is not; and it seems that the muscular apparatus of expiration is less easily set in motion than that of inspiration".

(d) "Spasm of the Bronchi would produce collapse of the lungs so that the intercostal spaces would be drawn in and the diaphragm would be raised. But "the organ is during the paroxysm distended to

its utmost limits in all directions". To this objection the upholders of the spasm theory would probably reply that the amount of collapse would depend on the size of the vesicles affected by the spasm, while the presence of emphysema, together with the extraordinary inspiratory efforts and the process of producing the "compensatory emphysema" of Gairdner, would account for the great distension.

(e). "The respiratory murmurs is said to be inaudible during the attack, "because the conditions of its production do not exist; sufficient air is not admitted to generate it." But if the bronchi were so completely constricted as alleged, life could not be sustained for any length of time". (Bennet p. 106. Such is supposed to be an answer to Salter's allegation. But Spasm of one pretty large bronchus would cause intense dyspnoea. Gairdner says "when collapse is sudden and extensive, it is -- a frequent cause of death" (Aitken's Vol ij. p. 708). But the conditions supposed by Salter moreover assume distended air cells, and a feeble interchange of air owing to inefficient respiration.

f. Strangely enough again we find Bennet taking one of Salter's proofs of Spasm to disprove it, viz, "The great mobility of the bronchi is incompatible with the assumption of a bronchial spasm". But the change of seat of a spasm, when we remember that Inspiration and Expiration are alternately trying to overcome or to allow it, is easily conceived of. Salter, differing from Walshe and Williams asserts that Expiration favours spasm. An asthmatic can certainly always "wheeze" the characteristic asthmatic wheeze during Expiration, and although loud reading and speaking cause the

bronchi to disappear, yet these acts are not "alone prolonged expirations," but also include forcible expiratory efforts against a closed larynx with the corresponding backward impulse. Besides, mucous accumulations are allowed to account for some of the bronchi; especially, those which employ themselves (Salter p. 36.).

(9). "But in the vast majority of instances the bronchial muscles are so greatly impaired in nutrition as to be incapable even of contracting." ~~This is~~ (Berkart. p. 107). In the cases ~~in~~ accompanied by bronchitis and emphysema, "the pathological changes primarily consist in an abundant infiltration of the bronchial walls with white blood corpuscles, which are either converted into connective tissue or undergo fatty degeneration. Thus the muscular fibres are paralysed by the degenerative changes around them." Dilatation of the tubes is the result. (Berkart. l.c.). This is the strongest part of the argument against spasm. If the tubes be so dilated and the muscles so weakened that a spasm is impossible — then the case is at an end. Records of 'post mortem' examinations as to the state of the muscular elements in asthmatics, the writer has been unable to find. Berkart states (p. 67) that muscular hypertrophy takes place in Bronchiectasis of the lungs, and in "that form of parenchymatous pneumonia described by Buhl as "muscular cirrhosis." (p. 154). It is not difficult to conceive cases in which the dilatation of the tubes has not gone so far or the weakness of the muscles, as not to allow of some degree of spasm.

Such is the prevalent theory of asthma, and such are some of the latest criticisms upon it.

The Nature of Asthma.

As Salter maintains, the causes of Asthma, its remedies, its symptoms, the absence of organic changes &c, lead one to the conclusion that Asthma is a nervous disease. He has also proved not only the possibility but also the probability of the existence of "Spasm", which, he maintains, alone explains,-

1. The sudden access and departure of the dyspnoea.
2. The presence of perfect health in other respects.
3. The absence of apparent lung disease.
4. The character of the Sounds.
5. The nervous element recognised in the disease, "for," he says, "only by the production of the muscular contraction of their walls, can nervous stimuli affect the condition of the Bronchial tubes (Salter. p. 37 et seq.).

In establishing his theory he does not seem to me to take sufficient account of the condition of the mucous membrane of the lungs in those cases more or less complicated with Catarrh; viz., the majority of the cases of Asthma. Moreover, "Spasm" is not the only condition that will explain the conditions he enumerates above, nor is it the only way in which nervous stimuli can affect the condition of the Bronchial tubes, for they can do so by means of the Vaso motor system.

Obstruction of the Bronchi by Hyperaemia and Oedema, by Bronchitis and Stenosis, Berkart regards as sufficient to account for Asthma (p. 134). He objects to any evidence of a "Nervous Nature" of the disease, and (as has been endeavoured to shew, unsuccessfully. There is hyperaemia and oedema, in most cases, but it is very often that of a "vasomotor paralysis" — a nervous hyperaemia, more comparable to that of "blushing" than to Inflammation.

All the evidence that Salter produces to prove the

Nervous nature of Asthma is as applicable to a Vasomotor explanation as it is to the "Spasm". Let us then consider the conditions &c, which would point out the Vasomotor explanation as being an element in the disease:-.

1. The transient post-prandial dyspnoea of many Asthmatics may be due to spasm, to vasomotor disturbance or to dilatation of the Stomach. It is seldom due to the last-cause probably, for, an Asthmatic may suffer from very great flatulency two hours or so after a meal, but have no dyspnoea then; and of the two former causes, there is generally no wheezing present, i.e. the chief evidence for spasm is absent, while we have present all the conditions likely to cause dilatation of the sensitive vessels, as we often see occurs in the "flow" on the cheek of weak individuals after a meal.
2. Some severe attacks of Asthma, caused by certain indigestibles, such as Crabs, Lobsters, Shrimps, may be devoid of wheezing; while nearly all attacks are preceded by a period of "dyspnoea" without wheezing.
3. The difficulty in Expiration. Salter holds the greater actual force of Expiration, but its lesser potentiality - as regard Inspiration in Asthma. "That there is the expiratory power in reserve, and that it is adequate to the instantaneous completion of the expiratory act, is proved by the sudden jerk that expels the remainder of the inspired air" (Salter p. 79). Why they should exert their power so as to cause a painful jerk is difficult to see, for the assistance thus given is trivial, and an Asthmatic would rather it were not made. They are undoubtedly very powerful, and are called into action during defaecation &c, and even painfully and for a prolonged time in parturition.

It would seem that the cause of their nonsuccess in Asthma, even from the beginning of the attack, more or less apparent, is the "hyperaemia" of the lungs. What air leaves the chest leaves easily at the beginning of the attack; the long painful expiration is an attempt to expel the blood – to make room for the urgently needed air, while the 'sudden jerk' will be found to be due to the fact that the diaphragm begins its descent, forcibly and suddenly, before expiration has really ceased, i.e. the efforts of its muscles.

4. In those who are liable to Asthma after eating Crustaceans, Urticaria is commonly associated with it. Are not both conditions due to vasomotor disturbance? Dobell (Winter cough &c. p. 39–41). has observed nettlerash of the bronchial and faucial mucous membranes. May not the more delicate mucous membranes blush easily as we see the delicate parts of the skin easily do.

5. The inspissated character of the sputum indicates an analogy between it and the character of the saliva when the sympathetic and not the secretory nerve of the gland is stimulated.

6. The intimate relations of Asthma and Hay-Asthma. In the latter we have no muscular element to deal with, while the hemopathia of the nose may become such as to prevent breathing through it. Many people are subject to both forms of Asthma. In some Asthmatics I have noticed that the state of the nasal mucous membrane is such, that, when they lie on one side, the lower nares becomes soon impervious. May there not be a somewhat similarly debilitated state of the whole respiratory track?

In fine, all the arguments for the Nervous Nature

of the disease are as applicable to the vasomotor disturbance theory of its production as they are to the Spasm Theory. This Theory also explains all the phenomena of the disease, as well as the Spasm Theory, for the Hyperaemia of an uneven surface accounts for the "wheezing" and its mobility. At the same time by accepting this theory, one is not called upon to give up the Spasm Theory, for it seems quite possible that both the Spasm and the Hyperaemia are present, but also, that both are primarily of "Nervous origin."

It may be pointed out in this connection, that, as in the liver and kidneys, a vasomotor disturbance produces a different or a perverted secretion, so also, in the lungs, we have the same result in the mucous glands.

The Aetiology of Asthma.

Firstly it will be necessary to examine into the conditions which give rise to the Asthmatic state, and secondly, into those which give rise to a paroxysm.

I. The conditions which give rise to Asthma.

1. The hereditary transmission of the disease or of a tendency to it. Such a transmission is especially noticeable in Nervous diseases, e.g. Insanity, Epilepsy, Hysteria, Neuralgia &c. (Bristowe - Aetiology of Disease). Salter found distinct traces of inheritance in 38% out of 217 cases, without noticing the frequent collateral development of the disease. Dr Dobell in his "Winter Cough", found in 29% out of 58 cases of Winter cough - that the parents were Asthmatic. Writing of Epilepsy in his Practice of Medicine (Vol ij. 229.

Dr Aitken says. "Hereditary predisposition plays an unmistakeable part in the history of Epilepsy; and there are few diseases in which heredity is a more important etiological condition". The facts pro Dr Gowers are — Heredity not of Epilepsy simply, but also as inherited pro insanity, hysteria chorea, paraplegia and infantile paralysis; Echeverria traced 28% in 300 cases; 31% by Dr Reynolds in a fewer number of cases; 36% in 1250 cases by Dr Gowers. The assumption of heredity in connection with Asthma is, by this comparison, seen to be well founded.

2. Diseases which have injured the circulation or the nutrition of the lungs - e.g. Fevers, Hooping cough, Bronchitis &c.

In the large collection of cases found at the end of Salter's volume, nothing strikes one more forcibly than the frequency with which such diseases were the original cause of the attack. (Bet Hosp, (p. 113). in examining these tables finds that in the 183 cases in which the original cause is stated, 132 were due to Catarrhs, Catarrhal Pneumonia, Whooping cough, Measles and Typhoid fever. In 10 cases only was it apparently spontaneous; 8 are attributed to climatic influences, 6 to hard work and anxiety, 6 to the outbreak and disappearance of Eczema, and 11 to such causes as Small pox &c -

3. The inheritance of diathesis, - e.g. Gout, Rheumatism, but especially of the "tuberculous" diathesis. Trousseau (Syd. Soc. Trans. Vol 1. 641 p.) describes Asthma as a diathetic neurosis. "Indeed", he says, "nothing is more common than to find herpetic, rheumatic, gouty, or haemorrhoidal affections transpose themselves into Asthma. Dr Aitken (l.c) quotes Bridham to the effect that - "when women are the subject of Asthma gout prevails in their families in a larger proportion

than in men". In Salter's tables one is surprised to find how few are the Asthmatics who suffer from Gout and Rheumatism, - 9 from the former and 3 from the latter. Of those who had a family history of Gout - 6 were females. Only one case is related as exhibiting a relation between Herpes and Asthma. One case is also recorded of a distinct alternation between Asthma and Rheumatism.

Out of the 226 cases, 86 are stated to suffer from undoubted Nervous disorders, e.g. hysteria, neuralgia, "nervousness", irritability and excitability.

4. Lesions of other organs - e.g. Heart-disease, Bright's disease, Gastro-intestinal catarrh &c,

One would expect, when the respiratory organs suffer as they do in asthma, that the Heart would suffer also, and it is surprising to find no more than 8 cases of Cardiac lesions among Salter's large array of cases. Probably, however, the presence of valvular lesions will produce real Asthma by causing sudden variations in the quantity of blood in the Pulmonary vessels, leading to their over-dilatation or ~~Extra~~-ordinary contraction.

Beckart (p. 83) mentions a case of Asthma in which Sebel found the urine loaded with casts. In the British Medical journal - 1883 - Vol 1. p. 811 - Dr Sheen of Cardiff calls attention to a case of Uraemic Asthma, in which a man, 55 years of age, who had been suffering from swelling in the legs for a short time previously was suddenly attacked with Asthma, and Dr Sanctuary of Salisbury (p. 956) and Dr Ringwood of Meath (p. 1064) in the same journal narrate cases somewhat similar.

5. The influence of age upon the development of Asthma.

a. The time of life most prolific of Asthma is the time of Measles, whooping-cough, infantile Bronchitis &c. This is also the time of greatest susceptibility of the Nervous system as evidenced in Convulsions &c

b. The period of adolescence furnishes comparatively few cases since the diseases of childhood, so apt to lay the foundation of it, are over, while the wear and tear and hardships of life and the deterioration of the body produced by them and by time have not commenced

c. From this time exposure and hardship and time begin to tell and shew an increasing Asthma rate - up to middle life.

d. The diminishing number thereafter indicates the diminishing probability of a person having the Asthmatic tendency postponing exposure to an exciting cause to so late a date — whereas the tendency to inflammation of the respiratory organs increases up to the end of life.

Salter - (p. 113) gives us the first three deductions and the following table — as their basis :-

The number of cases in which the disease commenced —

Under 10 ---- was 71.		between 40 - 50	was 24
between 10 - 20 -- 30		" 50 - 60	— 12
" 20 - 30 — - 39		" 60 — 70	4
— 30 - 40 40		" 70 - 80	1.

6. The influence of Sex. — Males are more frequently Asthmatics than women. Salter found the proportion 2 : 1. The following are the explanations offered :-

1. The greater exposure of males to the causes producing it. Salter finds that in that time when both sexes are likely to be exposed to colds &c, equally, i.e. between the ages of 10 and 20, the females preponderate as 14 : 9 in 23 cases.

2. Berkart (p 128) quotes Edward Smith that the number of males who survive the diseases of infancy that are known to be the causes of Asthma is greater than of females.

7. The influences of Class Occupation :- Salter, in his tables, finds seven out of nine of the males to be "gentlemen" and more than three fourths of the females, "ladies" - and he offers the following explanations —

(a). The rich are more likely to consult a medical man –
(b.) The children of the rich have a better chance of recovering from the diseases of infancy (the great causes of Asthma), because of care, proper nourishment &c. (Salter p. 402).

Those whose practice lies among the poor know that Asthma is by no means an uncommon disease among them, while Salter recognises the difficulty of forming reliable statistics in this connection, owing to the remark above – (a) –

It would be interesting to know if Asthma is common in places where Catarrhal Pneumonia is common, and among people who are exposed in their occupations to irritant dusts, e.g. masons and grinders, or exposed to colds – e.g. coachmen and sailors –

8. The influence of Climate – Very little is known of this subject. Trousseau says that Asthma is common in warm countries; the present writer has made inquiries in several "warm" places, but cannot get a corroboration of the statement. Is it not much more common in "moist" climates, than in dry – whether hot or cold?. It is my experience, though not numerically to be verified – that cases of Asthma were much less common in Edinburgh than they were in a Liverpool Hospital. They are certainly less common on the dry East Coast of South America than on the humid West Coast. {Fog, damp & moist air are almost invariably found together – and were the things most inclined to make the breath short in 24% of 58 cases noted by Dobell (Winter Cough p. 134).

II. The Exciting Causes of Asthma. – These are supposed to be infinitely numerous and as varied. They probably all act primarily on the nervous system and through it on the ~~[illegible]~~ vessels and muscles of the Bronchial tubes. Anything, therefore, that is capable of producing vasomotor paralysis or spasm, whether by direct contact with the pulmonary mucous membrane or reflexly, or by acting on the walls of the vessels

themselves, or through and from the brain — or anything capable of producing a spasm of the bronchial muscles, are capable of causing an attack of Asthma, and once the disease is established it is apt to become a "habit" of body.

1. The causes which act directly on the Naso pulmonary mucous membrane - Among them are - irritant gases, e.g. the results of combustion, of sewers &c, dusts, certain odours and emanations, such as those from dogs and cats mentioned by Salter, or from violets mentioned by Trousseau. Ipecacuanha powder will excite severe Asthma and Nasopulmonary hyperaemia in some people. Fogs, damp air, and sudden atmospheric and climatic changes — these must also be put down to this category. Also - the presence of Catarrh.

2. Causes acting reflexly on the Pulmonary Mucous membrane.

(a). Irritation of Gasto-intestinal passage from the presence of indigestibles or of those articles which are peculiarly offensive to some people, e.g. Lobsters, cheese.

(b). Exposure of the skin to cold and wet; e.g. of the face to a cold wind — will produce dyspnoea in some Asthmatics. "There is no external influence which so surely produces congestion of the nasopulmonary mucous membrane as wet and cold to the soles of the feet." (Sobell. Winter Cough &c - p. 185 + 134).

(c). Visceral diseases. e.g. Uterine disease.

3. Causes acting on the walls of the Vessels:-

1. Too much or too little blood in them — as in some cases of Heart disease

2. Offending state of the blood, as in Bright's disease, after food, and in ~~after~~ diathetic conditions, e.g. gout and Rheumatism:

4. Causes acting by the Brain:-

Emotional - e.g. Frights.

5. Irritation of the vagus, by pressure upon it of Tumours, Cancerous, Glandular, Aneurismal &c.

The above mentioned causes must be supposed to act on a person in the "Asthmatic condition" - to produce a paroxysm.

The Effects of Asthma.

This disease varies greatly in its intensity in different persons, nay, even in the same individual; its attacks vary in their frequency also, and hence a variety of effects result.

1. The "Asthmatic physique" has been previously referred to; in some, this physique is hardly perceptible, while in others it is so legible as to be diagnosable at a distance (Salter p. 169). "An Asthmatic is "round-backed, high shouldered and stooping," the body is bent forwards, the head is thrown back and buried as it were between the elevated shoulders. There is also "rigidity of the chest, the hanging or swinging of the arms which are bent at the elbows; the thinness of the body, the conspicuousness of the superficial veins, especially of the hands. Sometimes the complexion is Cyanotic; the face has generally an anxious expression, often indicating a greater age than the reality; if not dusky, is pale and thin. The mouth is open and the jaws hanging somewhat. The eyes are turgid, watery and prominent. The voice is often feeble and slightly hoarse and rough; his sentences short, for he speaks as if using "the last breath in his lungs". Such are the elements of Salter's description, and although many of the characteristics above enumerated are not necessary consequences of Asthma, e.g. Emphysema, Salter says that he has seen the "physique" strongly marked in some

cases where the lungs were organically sound. When Asthma attacks rickelty children, the yielding of the chest-wall gives rise to a "flattening of the thoracic parietes." Whether the Asthmatic stoop be due to the "Erector Spinae" foregoing its function as an Erector and becoming a mere "Inspirator" is doubtful. The explanation is perhaps too ingenious, even for cases in which no Spinal disease is present. There is, on the other hand, no evidence of the commonness of Rickets as a diathesis among Asthmatics, as must be supposed to meet Berkart's view of the commonness of curvature. The curvature is really seldom found except in the old and emphysematous, or in those who have suffered from very severe attacks and frequently. The explanation may be that the same malnutrition as is evidenced in the absence of fat all over the body and in the flabbiness of the muscles, may affect the bones and ligaments, which give way to the habit of stooping so indulged in by Asthmatics, in whom the Erector Spinae, like all other muscles, is weak.

2. Effects on the Heart and Circulation.—

Pulmonary obstruction throws a greater amount of work on the heart, especially the right side; dilatation and compensatory hypertrophy would be the natural result, and this is said to be so, and to last for a time, until ultimately the heart loses its force and dilatation of the veins of the body, with weak pulse &c. &c. said to result. Owing to Emphysema, it is generally difficult to make out the dilatation or hypertrophy, during life, and few post-mortem cases are recorded (Dr Peacock. Monthly Journal of Medical Science Vol XIX. p. 403.) The apex beat descends to the Scrobiculus Cordis

and remains there, owing to the slight ascent of the diaphragm even during Inspiration.

The number of Cardiac lesions mentioned by Salter in his very large table are surprisingly few; about 12 only recorded. The heart, during the paroxysms, seems not to lose the power of regaining the relative proportion between the cavities and orifices and valves.

The debility of the circulation of Asthmatics is its most marked feature, as evidenced in the "enlarged veins", although the absence of subcutaneous fat serves to account to some extent for their prominence. Eczema may also in some cases be the result of these enlarged veins, while in other cases, where we have no varicosity, it may be the result of influences acting in a similar manner upon the skin as upon the lungs.

3. Effects on the Tissues of the Lungs.

Even in those to whom Asthma is a mere symptom of some obscure Lung Disease, or at best, but a quasi-independent disease, it is such a condition as aggravates even the condition giving rise to itself. Emphysema is one of the most frequent concomitants and results of Asthma. The best example of Emphysema seen post-mortem by Salter was in a case of Chronic Asthma (p. 165). He also mentions Emphysema with Asthma in which Bronchitis had never existed (p. 167). Is Emphysema due to forcible expansion of the air vesicles during inspiration? to their compensatory dilatation as rendered necessary by a collapse of a neighbouring portion of lung? to the degeneration of the tissue and consequent lessened resistance of walls to any respiratory effort? or to their forcible expansion during Expiration? Whichever theory is accepted, the conditions in Asthma are

such as to admit of the adoption. We have cough present generally, expulsions with or without spasm to give rise to collapse, and violent respiratory efforts, while we have also a bad nutrition of the pulmonary in common with all other tissues.

Chronic Bronchitis, though perhaps not a result of Asthma, is very frequently present along with it, and serves as a help to it to produce Emphysema and other conditions. Emphysema was present in 66 out 226 cases, while Bronchitis was present in 77. (Salter's tables).

With such facilities present in Asthma for the development of Emphysema, it is surprising to find mention of such cases as these. — A man who has suffered for 44 years with the physical signs those of health; a man who has suffered for 37 years and no Emphysema developed; a man who has suffered for 24 years and has a perfect chest.

Bronchiectasis is another well known condition which results from Asthma. Salter saw a marked specimen of it (p. 157) and attributes it to the presence also of Bronchitis. Stokes (Syd. Soc. Ed. of his Works. pp. 137 et seq) relates a case of Asthma complicated with Emphysema and Bronchiectasis in a marked degree. The Bronchiectasis was mostly in one lung, and was probably caused by the contraction of septa of newly-formed connective tissue, while the Emphysema so marked in the other lung was probably compensatory.

Salter mentions the presence of "undue thickening and conspicuousness of the circular fibres of the bronchi" (p. 156). He mentions the hypertrophy of the muscular fibres — but omits to say whether this has been seen microscopically. There seems to be no one who has taken the trouble to record such a fact, if it has been noticed.

The Anatomical lesions mentioned by Beckash are those of inflammation of all the Bronchial tissues, resulting in the narrowing of the lumen of the tubes. An Exudation of serum and white blood corpuscles is poured into the interstices of the tissues, and press upon them, causing degeneration of the muscular fibres and of the Elastic fibres; there is hyperplasia of the Stroma of the lung, obliteration of the capillaries and air-vesicles with the impairment or destruction of the function and of the nutrition of the Secretory apparatus. The pulmonary vessels dilate and form free anastomoses between the arteries and veins, while "villous elevations form on the surface of the Bronchial mucous membrane which are vascular papillae consisting of tortuous vessels surrounded by connective tissue." (Beckash quoting - Biermer - Virchow &c - p. 125 Bristowe (under Bronchitis) says that the consequence of the infiltration of the submucous tissue may lead by mere irritation to stimulation of the muscular fibres to unwonted action or to their atrophy and degeneration. All writers note the hypertrophy of the mucous membrane and the possibility of its leading into Collapse.

~~This~~ "pathology" gives us, in the main, the conditions necessary to produce a paroxysm of Asthma - an uneven surface, easily rendered humid, and containing muscular fibres which may or may not contract according to whether they are active or atrophied and degenerated.

The Relation of Asthma to Gastro-intestinal derangement is also well-marked, but as it is exceedingly doubtful whether the one be the cause of the other or whether the condition of both mucous membranes be due to some primary nervous cause, it is perhaps wiser not to go into the subject.

The Clinical History of Asthma.

A patient subject to Asthma will, as has been shewn, in all probability have a history of hereditary tendency, either from the inheritance of Asthma, or of the Gouty, Rheumatic or Nervous diathesis. He will generally also have a history of some previous disease, e.g. Bronchitis, Catarrhal Pneumonia, Hooping Cough &c, which implicate serious injuries on the Pulmonary tissues.

His disease will consist of paroxysms, more or less severe, the intervals between these generally depending upon the development of the consequences or the presence of the concomitants of Asthma, such as Emphysema or Bronchitis, together with liability to the exciting causes.

The phenomena are generally said to be ushered in by "premonitory Symptoms". ~~Among~~ them are enumerated "drowsiness, wakefulness, mental activity and buoyancy of spirits"; Salter mentions a case in which "Ophthalmia" always warned the patient of an approaching attack; ~~of~~ flatulence, flatulency or other signs of Dyspepsia "Itching of the skin" is, according to Salter very characteristic of Asthmatic dyspnoea, especially of subjects of Hay-Asthma. These symptoms, generally speaking, are vague, and admit of different explanations; some of them are fairly characteristic; others, e.g. Itching of the skin, it has not fallen to my lot to be able to verify.

In 19 out of 20 cases, the paroxysm comes on ~~soon~~ after midnight, awaking the patient. Three cases are mentioned by Salter, in which the patients first awoke and the attack came on subsequently. The horizontal position of the body, favouring the influx of the blood towards the heart and therefore into the ~~right~~ lungs; the greater facility with which the causes of Reflex actions act during sleep, as is evidenced by the "incontinence of children &c, owing probably to the diminution of inhibition; and also, the fact that all the functions

of the body are periodically lowered at that time of the night; as is evidenced in the lowness of the pulse and temperature - all these may perhaps supply the explanation of this occurrence.

Among the early symptoms of the attack "profuse diuresis" is said to be prominent; the diuresis of a "pale limpid" urine. Is not this due to vasomotor paralysis of the renals in the kidneys? Dr Ringer observed in a case, immediately after the fit, - a deficiency of urea and of Chloride of Sodium.

The difficulty of breathing which oppresses the patient, an observer would have seen to have increased gradually up to the time of awakening. Wheezing, audible at some distance, is present, and unless some remedial means be had recourse to, the dyspnoea will continue to increase until the patient will have to call to his assistance all the muscles of expiration and inspiration, so that his head is fixed, the two Sterno-Mastoids standing out prominently, the chest hardly moving from its fully distended position, except where the movements of the diaphragm is drawing in the sides; while in addition, any position that is supposed to increase the respiratory powers is instinctively adopted. This dyspnoea may or may not be accompanied by a cough. Inspiration is full and forcible; expiration is slow and prolonged. All movements are distressing.

The expression of the face is anxious, the mouth open, gasping for breath; the eyes often fixed and staring; often turgid. The face pale or even cyanotic.

There is a sense of constriction of the chest.

The temperature of the body is said to fall; the

skin is pale and shrinks, even when covered with perspiration.

The heart beats feebly and rapidly, and the apex beat is felt in the Scrobiculus

The number of respirations in the minute are either normal or less than normal, but expiration becomes much longer than inspiration, while the pause is lost. Before the prolonged Expiration is over, the diaphragm suddenly commences its descent, and causes the "jerk" at the end of expiration.

Auscultation shews the respiratory murmurs to be either very indistinct or even absent, while sonorous and sibilant rhonchi are abundant, and the wheezing even audible at a distance. The Sounds are continually changing their site, and may be heard all over the chest.

The development of the attack towards its point of greatest intensity may be sudden or gradual, and its duration from a few minutes to some days. Salter relates a case lasting two days and two nights.

Any demand upon the muscular system or upon the respiratory space greatly aggravates the dyspnoea, and food and all movement is abstained from.

Salter (p. 83). states that the Spasm disappears coincidentally with the appearance of expectoration, but the writer has always found the relief to precede expectoration, sometimes by a considerable interval, while its quantity may be very small even after a severe attack. Sometimes, however, and in some cases, expectoration is profuse, though a difference should always be made between the "spitting and hawking" during smoking for the relief of the paroxysm and the subsequent

expectoration, which is composed of water, salts, mucus corpuscles, cells of various kinds, and sometimes blood, in varying quantities - It comes up with hardly an effort, in small round pellets, or long bead like strings, tough, and of a greyish or transparent colour, - corresponding closely to the expectoration of Laennec's pituitary catarrh - The colour changes as the secretion becomes older After the attack is over and relief is obtained, the patients happiness would be complete, were it not that experience ~~has~~ has taught him that he may expect a series of paroxysms to follow, once the habit is set in. The fatigue of the paroxysm passed, the patient is returning to his ordinary health.

The Diagnosis of Asthma.

Asthma must be diagnosed by the character of the breathing, as described in the last chapter, but especially by the prolonged difficult and painful expiration - The History of previous attacks with intervals of apparent health may, in some cases, facilitate the diagnosis.

Pure uncomplicated Asthma is rare, but its existence must not be denied by the upholders of any Nervous Theory of its Production.

The diseases which Asthma commonly complicates, e.g. Emphysema and Chronic Bronchitis, and others, which it complicates more rarely, such as Bright's or Heart Disease, are easily diagnosed, and should always be sought for, as their presence might explain the Asthma, although there may dyspnoea in such cases of quite a Non-Asthmatic character.

Angina Pectoris is diagnosed from Asthma by the characteristic pain - Affections of the Larynx or of the diaphragm causing any dyspnoea simulating Asthma, would, in all probability cause some change in phonation or in the manner of breathing, that would call attention to these parts. Embolism of the Pulmonary artery might cause a sudden dyspnoea, but the congestion induced would simulate an inflammatory rather a nervous hyperaemia, and the respiration would be more like that of Acute Bronchitis or Pneumonia than that of Asthma. Such cases are, however, obscure, the previous history of a "source" of embolism might help the diagnosis.

Prognosis in Asthma.

The prognosis in Asthma is favourable as regards life; unfavourable as regards the discontinuance of the attacks. Treatment greatly ameliorates the condition, even when much Emphysema is present. Complicating Heart disease, it is an unfavourable element in the prognosis of it; while complicating Emphysema or Bronchitis, the prognosis of Asthma is really that of those diseases, mainly unfavourable, except when the patient can live in a climate where there are conditions favourable to their amelioration, or to the non-production of paroxysms. Salter maintains that "the young are likely to "grow out of the attacks" but an adult subject is likely to get worse, because the "acclimation" of youth will probably be lessened, while in the older, the disease is nearly invariably connected with some organic lesion.

The Treatment of Asthma.

It is convenient to divide this part of the subject into the treatment of the paroxysm and the treatment of the condition.

The treatment of the paroxysm, owing to the distress caused by the dyspnoea, as well as because of the injurious effects its prolongation has upon the lungs, the heart and the circulation generally, calls for active measures. Chloroform stands at the head of the list of remedies used for this purpose, and its greatest efficacy is seen in the severest cases. It can be given with impunity even in cases where suffocation seems imminent, and if the attack be not caused by Bronchitis, the relief is complete and permanent. In cases in which Bronchitis is the cause, the relief will not be permanent, but the paroxysm will be apt to return. The same remarks will apply to Ether, but Ether is more disagreeable to inhale, while it is also apt to aggravate any Bronchitis which may be present, and thereby do some harm. Dr Watson in his Practice of Medicine relates an interesting case of relief by Ether.

It is somewhat against these remedies that they cannot be entrusted to the patient or to his friends, and also, that a prolonged use of them produces a condition very similar to Delirium Tremens.

Pilocarpin, gr of a grain doses, hypodermically, has been greatly recommended by Dr Berkart. (British Medical Journal. June 19. 1880). This drug modifies the circulation greatly, and exercises great influence upon the glands both of the skin and of the Bronchial Mucous Membrane. Berkart claims that it has a remedial tendency upon the asthmatic condition. The relief of the paroxysm by it is swift and complete

but the nitrite has not seen permanent beneficial effects, whereas it has a weakening influence upon the system generally.

Atropia, (1/200 gr. hypodermically) - I have seen prompt relief, probably by causing the contraction of the dilated pulmonary vessels. Ringer (Therapeutics) sums up its action - as "stimulating the respiratory centre and the vaso-motor centre".

The "Atropaceæ" furnish us also with other means of relieving the paroxysm in the leaves of the various species of Datura. Of these, I have found the Datura Tatula to be the most efficacious. The leaves are generally cut up and smoked. It is a common error to suppose that it is necessary to inhale the smoke and to let it enter the lungs, but a long observation of a few cases enables me to say that 'mere ordinary smoking' of the leaves serves the purpose equally well. The action is probably the same as that of Atropia.

Nitre fumes, in inhalation, have been highly recommended, and they are undoubtedly of great efficacy in some cases. According to Dobell (Mitchell Clark p. 202) they give relief best in those cases in which the tumefaction of the mucous membrane is most marked, while Salter (p. 253) thinks they give most relief in those cases in which the complications are fewest. It is difficult to see how these irritant fumes can relieve a case in which Bronchitis is present, though they do, as Dobell suggests, act by "respiratory and causing the resolution of the flushed and turgid condition". Like Ether, they may relieve such a condition for a time, but the irritation undoubtedly aggravates the Bronchitis. It is my experience, they give relief in the purest cases,

and may they not, by exciting violent expiration (cough) help the emptying of the turgid vessels as well as ~~well~~ clear the air-passages? Accordiny to Niaud (quoted by Berkart p. 256) the fumes consist of Nitrous Oxide and an Aniline compound, whilst Eulenberg says they consist of Cyanogen, Cyanide of Potassium and Ammonia. The effect is certainly mainly that of "irritating fumes". Trousseau (l.c) recommends the smoking of Arsenical cigarettes; he also mentions the topical application of Ammonia to the pharynx, as well as its inhalation, as means of relief, but he calls attention to the untoward results which they sometimes produce.

Depressants are referred to by Salter as among the most valuable of the remedies. Tobacco smoking, the administration of Tartar Emetic and Ipecacuanha give relief in a wonderful manner. He insists that that they should be given early, before any considerable degree of pulmonary congestion can have appeared. Habitual smoking of tobacco renders it of no efficacy as a remedy. Berkart explains their action by saying that "they reduce arterial pressure and therefore increase exudation and favour the detachment of foreign bodies"; even this process would require some time, but as the relief is said to be immediate, we would suggest as Salter, the relief of spasm, or else, that the lowering of the blood pressure induces the arteries to contract, so as to allow the Bronchial mucous membrane to shrink.

Stimulants are known to be often useful, and have generally been resorted to before the aid of a

medical man has been called in. Whiskey, Brandy and Gin are often praised, but especially the former. Their action is thus explained by Salter - (1) - they act conversely to sleep - which (a) produces insensibility to respiratory arrears, and (2) exalts reflex action. I should rather say that the inhibitory activity of the Brain is lessened during sleep. Stimulants often relieve an attack produced in the day time as by some irritant dust, and probably act by increasing the force and number of the heart's contraction, and increasing temporarily the activity of the vasomotor centre. How they could relieve spasm it is difficult to conceive. Similarly to the action of stimulants we must suppose that of Hot Coffee, or tea, or that of Ammonia, Ether &c, to be.

Nitrite of Amyl and a weak Solution of Nitro-Glycerine have, in some cases, been found very efficacious, especially in cases of Bright's disease complicated with Asthma. (Dr Sheen of Cardiff's case, already quoted). "The most characteristic effect of this drug is its influence on the vascular system. It relaxes the whole arterial pressure", owing to "dilatation of the arterioles." It may act either on the Vasomotor centre, or even on the Nerve trunks or arterioles. (Ringer). May we not suppose that there may be an Asthma due to Vasomotor irritation and Vasomotor paralysis, Each admitting of different means of relief?

Emotion modifies innervation greatly, and several interesting cases are recorded in which Asthmatic paroxysms, by the occurrence of any sudden cause of emotion, have been relieved.

2. The Treatment of the Asthmatic Condition.

A paroxysm of Asthma having once appeared, its recurrence must be looked for; the habitude of the disease being one of its characteristics. When the habit once has set in, one of the most efficient ways of overcoming it, is a change of Atmospheric conditions, - e.g. - from a moist into a dry air and vice versâ.

Those diseases which are known to cause Asthma should call for the greatest care in the superintendence of the period of their convalescence. Good nutrition and the avoidance of premature exposure to cold and wet should specially be cared for.

In treating an asthmatic there are two distinct periods to recognise, viz, the period immediately succeeding an attack, and the ordinary state of the health.

During the paroxysm, the lungs, the heart, the liver and, in fact, the whole circulation have suffered, and remedies directed to the relief of congestion, of a passive nature, are indicated.

1. There is usually present some congestion and tenderness of the Liver. A cholagogue purgative relieves this, and the administration of a Blue pill to be followed by a Saline purgative, will be found to fulfill all the necessary conditions.

2. Any Bronchitis, Congestion or Oedema of the Lungs, so commonly present, should be immediately treated by Sinapisms or Cataplasms, accompanied by internal remedies, as indicated by the quality or quantity of the Secretion. Chloride of Ammonium is a most valuable remedy, diminishing the viscidity of the mucous secretion greatly. When the Bronchitis is slight or chronic, Iodide of Potassium is still better. One of the best measures for relieving

the pulmonary circulation is a course of warm baths.
For the Asthmatic state a Tonic treatment will be found the most suitable; such tonics as are known to affect the circulation principally being the most efficient.
Digitalis restores the tone of the Heart and vessels, and is nearly always called for; and in addition Iron or Arsenic may also be given, and have been given with great benefit; they seem to help nutrition greatly.
May not Arsenic have an effect on the tonicless vessels of the lungs somewhat similar to that it may have on the vessels in Eczema?
Asthmatics are generally Dyspeptics and great attention must be paid to diet, its quantity and quality.
Salter recognises a Dyspeptic Asthma, for the cure of which he proceeds as in the treatment of Dyspepsia.
Especially does he point out the necessity for Asthmatics to avoid meals, except at such times that their digestion be completed before bed-time, i.e. before such time as the undigested food may act as an excito-motor stimulant. Is not the vascular condition in the lungs of Asthmatics comparable to that of the brain of those individuals who suffer from night-mares? It is agreed that all alcoholic beverages, especially malt liquors are injurious to Asthmatics.
The Diathetic condition of a person suffering from Asthma requires consideration similarly to that which it calls for in all other diseases.
Trousseau (On Asthma) recommends a treatment combining Belladonna, Turpentine and Arsenic. He gave each drug successively for ten days. Ducks trusted to Sulphur, but each Asthmatic will call for special

study. Belladonna might be an useful arterial tonic.

The Climatic treatment of Asthma is of great importance and interest, but is a very difficult study. Very trivial changes of residence, e.g. from one street into another, have been known to exercise great influence. Such may be explained perhaps by the presence of some peculiarity in the place, e.g., the presence of sewer gas, bad ventilation, the presence of pollen powder &c. A sea voyage removes a patient from all such influences and ensures conditions favourable to convalescence generally; yet, I have seen two cases, during long voyages through various climates, not at all benefitted.

When a patient is Asthmatic in one locality, it would seem that the air of the place is peculiarly inimical to him, irritating his bronchial mucous membrane. Warm Climates are generally beneficial since Bronchitis, perhaps the commonest excitant of Asthma, is less likely to occur under such conditions. In warm moist atmospheres, e.g. that of Callao, Asthma is quite as common as it is in the western parts of Britain, where I believe it will be found commonest with us. On the other hand, in the high altitudes of South America, especially on the Eastern aspect of the Cordilleras, it is very rare, and Asthmatics from the lowlands and Coast-towns go there for the cure of their disease. There the air is cool and very dry. Perhaps the best rule that can be formulated for our guidance in this connection is this — that those who are Asthmatic in a moist atmosphere should

seek a dry one, and vice versâ. The relative humidity of the atmosphere seems to have much more to do with the causation of asthma than its temperature. Most of the asthmatics I have known have been benefitted by a "dry climate".

For the poorer class of patients, conditions nearly resembling beneficial climates must be sought for. Respirators afford a fairly efficient protection against cold moist air.

Ventilation of rooms, exercise, the use of cold and warm baths, and all means tending to improve the general health, will greatly assist the treatment of Asthma.

Finally, all complications, e.g. Dilatation of the Heart, Collapse of the Lungs, Emphysema, &c, call for ordinary treatment.

A Tabulated appendix of Cases.

Number - Name - Sex. Age - Appearance and occupation &c	Residence -	Age at first appearance.	Duration of Illness.	Cause (a) Original (b) Provocative	Frequency of Attacks	Time of Attack,	Any Complications	Associated diseases and family History	Effects of Remedies
1. W. R., Male, Aet 29. Thin. 7 feet 8 in high 140 lbs weight. Muscles flabby and small. Professional.	A Hilly and rocky part of Carnarvon-shire, Wales.	About 7 or 8 years.	About 22 years.	(a)- Probably Catarrhal Pneumonia (B.). Exposure to colds, especially to damp air - Cold feet - Errors of diet, especially "crustaceans": very sudden change of temperature.	Once attack up, are apt to come on nightly	Soon after midnight	Some degree of Emphysema. Slight attacks of Bronchitis easily set up. No permanent expectoration.	Circulation feeble and digestion faulty. Father, thin and subject to Sneezing; sister also. Mother very hysterical.	Hot drinks, sinapisms and poultices i.e. treatment directed towards Bronchitis gives relief. The Paroxysm is relieved by smoking Datura Stramonium or Dat. Tatula. Nitre fumes efficacious when there is no Bronchitis. Residence in Edinburgh - very beneficial, and so also Residence at Sea, in warm climates.
2. J. R. Male. Aet 38. Well formed and muscular, with a slight tendency to obesity. A Farryman	Same as above.	26 years	12 years.	(a)- Probably an attack of Bronchitis complicating Rheumatic fever - (B). Taking cold	Apt to come on nightly	After a few hours sleep.	None.	Has had several attacks of Acute Rheumatism, but the Heart is sound.	Treatment always relieves and is directed towards the complicating Bronchitis. Datura smoking of no Value. A prolonged course of Arsenic and Iodide of Potassium did good. Changing residence into a drier better house has greatly improved him.
3. Rev. W. R. D. Male. Aet. 42. Looks pale and thin, but is fairly Muscular, and of good weight -	Same as above.	about 20 years	22 years.	(a). Bronchitis. (B). Taking Cold - Exposure to rain and cold -	Apt to come on nightly during Cold damp Seasons.	Always after a few hours sleep.	Slight degree of Emphysema. Stray tendency to Bronchitis.	Patient is subject to fits of "itching" of the skin, to Eczema, apt to Eczema Capitis.	The Asthma nearly always complicating Bronchitis more or less severe, treatment is directed. Sinapisms & demulcent drinks ultimately relieving. Residence in Edinburgh as a Student gave great relief. Tonics and exercise beneficial.

Number – Name &c.	Residence.	Age at first appearance	Duration of Disease	Cause A { Original B { Provocative	Frequency of attacks	Time of Attacks	Lung Complications	Associated Diseases & Family.	Effects of Remedies.
4. J. G. O. Male. Aet. 35. Strong and healthy-looking. Quarryman.	Same district.	25 years	10 years.	A. It came on after an attack of acute Rheumatism. B. "Taking colds," and "singing too much".	They are apt to come on in Spring time.	After midnight, getting worse towards morning.	Slight tendency to Bronchitis.	Subject to Dyspepsia. Mother asthmatic; and one sister died of Phthisis.	Nitre paper relieves greatly. Tonic treatment most beneficial.
5. S. O. Female. Aet. 60. Thin and weakly-looking. Quarryman's wife. (Mother of No 4	Same district.	about 30 yrs.	30 yrs.	A. – Unknown B. – "Taking cold" "Hay season"	Once started are apt to come on nightly and for a long time.	Generally in the night-time.	Some Emphysema and a good deal of Chronic Bronchitis.	Dyspepsia.	Very little treatment has been tried, and that generally for the Bronchitis. Inhalation of Datura smoke beneficial, and of Nitre fumes also. Summer dry weather and Tonics do most good.
6. H. M. Male Aet. 32. Thin; husky voice. A slight asthmatic build. A Quarryman.	Same district.	quite young.	A good deal over 20 years.	(A). Probably Bronchitis = ("a bad cold"). (B) – Cold weather and dust.	Come on frequently and at irregular intervals	Generally between midnight and morning.	Some degree of Emphysema	Mother subject to Asthma and is very "Nervous".	Tobacco smoking, so as to induce coughing and much expectoration gives relief; so do Nitre fumes. Went to Pennsylvania, but had to return, because the paroxysms became severer and more frequent.
7. G. W. Male. Aet. 31. Thin; voice slightly husky. Slight. A Quarryman.	Same district.	about 8 years.	23 years.	A. – Unknown. B. – "Taking cold" by exposure to cold damp air.	A martyr to Asthma in Winter time	Come on nightly after midnight.	Slight Emphysema. Bronchitis easily excited	A Brother and two sisters died of Phthisis.	Nitre fumes and Datura smoking, especially the latter relieve the paroxysms. Tonics & fine weather complete the recovery.
8. W. J. M. Male. Aet. 6. Chubby-faced boy but "pigeon-chested" and thin. A farmer's son.	A farm on the North Coast of Anglesey.	About 2 years	4 years.	A – Hooping Cough and subsequent Bronchitis, probably. B. Cold damp weather.	Has suffered severely for several winters.	Comes on shortly after sleeping.	Shape of Chest much modified.	Suffers from Laryngismus Stridulus and Bronchitis.	Fomentations, Sinapisms and Poultices. Inhalation of Chloroform relieves the very distressing paroxysm.

Number, Name, Sex &c.	Residence	Age at first appearance	Duration of Disease	Cause (A) original (B) Provocative	Frequency of attacks	Time of attacks	Lung Complications	Associated Diseases & Family	Effects of Remedies &c.
9. W. J., Male. Aet. 38. Well formed, and healthy-looking. A "Sailmaker".	Amlwch on the North Coast of Anglesey.	16 years.	22 years.	A – ? B. Taking colds by exposure to cold damp; wet feet &c.	Every winter and Spring.	…erally …ghtly. …etimes …y evening.	Very slight Emphysema.	Mother Asthmatic.	Chloroform relieves very severe paroxysms. Dat. Stables smoking a necessity with him in winter. A course of Chloride of Ammonium and Iron did him much good.
10. S. W. Female. Aet. 66. Stout & feeble, with constant dyspnoea. A pauper.	Same as above.	?	A great many years.	A – ? B. Taking colds and over-exertion.	Nearly always afflicted; especially winter.	…se …aroxysms …fter …idnight.	Much Emphysema. Some amount of Chronic Bronchitis.	Tendency to dropsy – from weakness of the Heart.	Strong doses of "Chlorodyne" used to do her more good than anything. Injections of Pilocarpin gave no relief. Ultimately died of "Dropsy".
11. A. F. Male. Aet. 20. Thin and slight. A Schoolmaster.	Glasgow. 16 yrs. Valparaiso. 3 yrs.	About 6 years.	14 yrs.	A. Bronchitis, after Measles. B. Cold weather, dry or moist.	Winter time.	…ightly …tween midnight and …orning.	Some dyspnoea permanent. No Cough.	History of Hereditary Transmission.	Smoking tobacco and Stramonium relieves; Nitre fumes aggravate. Exercise greatly relieves. Three years in Valparaiso led him to think his Asthma had left him. It returned again in Glasgow.
12. J. P. B. Male. Aet. 60. Fairly well nourished but had the Asthmatic Stoop. A Merchant.	London. Buenos Aires.	48 yrs.	12 yrs.	A. Bronchitis. B. Exposure to damp air, warm or cold.	More Subject to Asthma in winter.	…ightly between midnight and morning.	Slight amount of permanent Dyspnoea.	Slight feebleness of the Heart.	Believes greatly in the efficacy of Datura, and is an inveterate smoker of it. He suffered much on board ship, owing to the moist tropical heat and the cramped space allowed in the cabin.

I do not claim to have any of the arguments pr the Theory or modification of a Theory of Asthma that I propose upon the few numbers of cases it has fallen to my lot to observe. I have carefully read Salter's cases, and have based my Table upon his, and I do not find that there is any incompatibility between Salter's Thesis and the modification of it which I now submit, albeit with much diffidence, to the judgement of the Medical Faculty of the University of Edinburgh, hoping it may meet with their approval, and prove to them that the writer has not ceased to labour and to think, however unavailingly or erroneously he may do both.

William Rowlands, M. D.

at Rio Janeiro.

March. 22nd 1884.