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A Star

Graduation Thesis by

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University of Edinburgh
Session 1862-63.

Subject.

Observations on Smallpox

A thoughtful & careful Essay.
W.R. takes a more hypothetical flight than Mr Simon, avoids the history (anyone?) ~~which leads~~ to no satisfactory results, & limits himself to some obs. suggested by a study of late Epid^c
- Gives a table at p. 7 intended to support his opinion of moisture in atmosphere as conducive to Epid^c — Explained. Vaccination Insists strongly on the duty of vacc^n, — & illustrates its value.
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Observations on Smallpox.

The great interest that surrounds the subject of Smallpox, in the History as well as in the pathological manifestations of the disease, does, I think, render an apology hardly necessary for my selecting as one, upon which to write my graduation thesis.
But Smallpox ~~has~~ is this year a disease of more interest than usual, inasmuch as this city has lately been visited by a variolous epidemic of ~~more than~~ considerable severity. And were it necessary, that I should seek further for an apology, I might state that I myself have been a sufferer from this interesting yet loathsome disease.

I shall not, however, attempt to enter into the History of Smallpox and to take up the inquiry as to whether the disease was known to the ancient Greeks. for while the former could only be a ~~matter~~

recapitulation of what has been already written upon the subject. The latter is a question which I am satisfied can never be truly solved. But taking advantage of the late epidemic, I shall content myself with merely recording a few observations which have been suggested to me by a clinical study of the disease during this Session. I have taken this method of getting up my graduation Thesis as the one most pleasant as well as most instructive.

I shall in the first place endeavour to say something about Pestilential epidemics, confining myself chiefly to that which recently visited Edinburgh.

When we wish to determine the nature of an epidemic, we are in a great measure dependent upon the records of Hospitals. We may indeed estimate its ravages in a general way by referring to the Registrar General's reports, but how to estimate its rate of comparative mortality, to watch its increase and decline, or to find out

The various modifying circumstances which may have come into play is only to be done in the way I have indicated, by observing its effects in Hospital and also by studying the various meteorological and other hygienic conditions, which may have been likely to affect it.

The commencement of the late epidemic in Edinburgh may be dated from the Second week of August 1862. During the Month of July 1862, no deaths from Smallpox took place in the city. In August there were 4. in September 11. in October 31, in November 53. in December 72 and in January 33. There were admitted into the Royal Infirmary during August 5 patients, in September 21. in October 49. in November 102. in December 98 and in January 34. I write in February and the disease may be said to be now no longer epidemic, for only two or three straggling cases have been admitted up to the 20th. It will be seen that the epidemic raged with the greatest virulence in the Months of November and December.

It is a question which has puzzled the mind of every philosophical physician, as to whether there is any relation between epidemics and the atmospheric conditions existing at the time of their occurrence. No one doubts that there is some such relation but of which the exact nature is by no means determined. Every now and then cases of small pox are occurring, indeed, a year does not pass without a few deaths from small pox taking place in every large town. But how does it happen that at one time hundreds are attacked and that at another only a scattered few? and why is it that at one time, an epidemic begins at one period of the year and that at another time an epidemic of the same disease has its commencement at quite a different period of the year? "Nothing" says Sydenham "strikes the mind that contemplates the whole and open domain of medicine, with greater wonder than the well known varied and inconsistent character of those diseases which we call epidemic. It

is not so much that they reflect upon different conditions of climate in one and the same year, as that they represent different and dissimilar constitutions of different and dissimilar years.

Subsequent experience has confirmed the truth of Sydenham's observation and the instances which I might record in support of it are very many. Thus for example the late Barcelona epidemic fever in this city commenced in August and went on to January, while the epidemic which took place in London in 1864. as described by Dr Gregory began in January and went on to December. While that which took place in the same city a few years later began in the month of May 1847 and went on to the month of March 1849.

A true explanation of these remarkable facts must, I think, be sought for in the science of Meteorology. On this point Sydenham again writes:- "How much and diligently and to the best of my abilities, as I have observed the different characters in respect to the more manifest atmospheric

change of different years, and that with the view of detecting therein the reasons for the discrepancy, amongst the epidemic diseases. I am free to confess that I have not proceeded one single inch in my way." The modest confession of the father of British Medicine was no doubt literally true. But our knowledge of the collateral sciences is now much more extensive and ~~exact~~ precise. so that by studying the relations of physics to medicine, we may at least approximate to some correct results.

Now, in one respect, at least, the state of the atmosphere presented a peculiarity and that in a marked degree, during the months of the late variolous epidemic. I refer to the increased humidity of the atmosphere as ~~compared~~ with that during the months of August, September, October, November ~~January~~ December 1862 and January 1863. as compared with that of the same months during the 1856.7.8.9.60861.

From an examination of the Registrar General's tables, the following results will

arrived at.
he ~~come~~ to. Complete saturation is considered as 100.

	1862	Average of the years 1856. 7. 8. 9. 60 & 61.
Humidity in Aug.	85	78.
" Sept.	85	80
" Oct.	87	84
" Nov.	89	85.
" Dec.	86	86
" Jan. 1863	89.	85.
General Results	87	83.

It is certainly an interesting fact and I do think it is more than a mere coincidence that for the last 6 years we have had no true epidemic of small pox, and that ~~the~~ during these years the ~~average~~ humidity was on an average 4 per cent less than it has been this year. which is remarkable for the prevalence of small pox.

The table which I have constructed above also shows another interesting fact. I have already shown that the epidemic was most severe in the month of December and that there was a remarkable ~~decline~~ decline in January. The increase in December seems to be connected with the increased humidity of the previous

month viz. Nov. while the decline of the epidemic is connected with the decrease of humidity in January in December. For if the moisture of the atmosphere has any influence at all, on small pox epidemics, it must be exerted chiefly as a conductor or as a conveying agent of the poison. Now if a person dies of small pox he is probably infected at a period between 3 and 4 weeks before his death. Therefore those who died in Dec. must have received the contagion in Nov. a very humid month, while those who died in Jan. must have been infected in Dec. a month the ~~average~~ humidity of which was exactly the same as the average humidity of the Decembers of the six years before. Thus therefore one might account for the crisis and decline of the late epidemic, taking place in the months of December and January. It may be said that this may be connected with the temperature, but the statistics of various epidemics show that this has very little to do with their virulence.

The above, however, is a mere theory, and it can be nothing else until more facts

of a similar nature are brought forward to support it. I regret that the opportunities which I have had of examining meteorological and statistical papers have been too limited to allow me to prosecute this inquiry further.

To return to the statistics of the epidemic I have said that 311 patients were admitted into the Hospital. The wards set apart for small pox cases were Nos 1. 2. 3 & 4 fever house. and for a short time No. 18 Medical House. Dr Bennett also admitted a few cases into his wards for clinical instruction. In the fever house records were kept by the Resident Physicians Drs Fraser and Cunningham. first as to whether the patient admitted was vaccinated and secondly as to what was the nature of the disease, whether confluent or discrete.

Of 283 cases admitted into these wards 205 were vaccinated. and 77 were not. while one had the disease before. About 23½ per cent admitted were not vaccinated. This is certainly a condition of things by no means creditable to Edinburgh. Nevertheless it is an

improvement upon what used to be the case in Edinburgh 40 years ago. We find Dr John Thomson describing an epidemic which took place in this city about that time - where of 556 cases which came under his observation 205 or nearly 37 per cent were not vaccinated. But even this is much better than that which existed in the London epidemic of 1864-65. where of 647 cases observed by Dr Gregory 312 or 48 per cent were not vaccinated.

It is sad to think that in this country, the birthplace of Jenner, people should thus be so shamefully unmindful of their own and of the interests of each other. And it is much to be deplored that a narrow minded and short-sighted policy should prevent our government from adopting the remedy, so plain and obvious to every one, namely, compulsory vaccination, vigorously carried out by law.

Ever since the protective power of vaccination against small pox, was fairly established by Jenner. so deeply have medical men been impressed with the benefits of that great discovery, that volumes upon

volumes of evidence have been published with the effect of proving it to be a truth than which there is none more sure in medicine. To this great mass of evidence I will also add a little more. For, during the recent epidemic, of 311 cases admitted up to the end of January 40 died, of whom 34 were not vaccinated.

Of the six who died and who were vaccinated, one was seized with smallpox after labour. A second was attacked in the Medical house while labouring under gangrene in the lung. A third a child had severe convulsions. A fourth, a dissipated man, had delirium tremens. The fifth was a young woman who was vaccinated on the 16th of October and admitted into the Hospital with smallpox on the 25th so that the virus of variola must have been in her system before that of vaccinia which in all probability had little or no effect.

I know nothing of the history of the sixth case. I do not remember having seen it myself nor have I been able to ascertain anything of it.

Now as regards the severity of the cases, whether they were confluent or discrete. 283 cases were admitted into the fever House up to the end of January. 231 of these were discrete while 52 were confluent. Of the discrete cases 34 or 14 per cent were not vaccinated. Of the confluent 43 out of the 52 or a proportion of about 81 per cent were not vaccinated.

The great benefits conferred on the human race by ~~by~~ Jenner, and therefore as evident in this epidemic as they have been in every other since the discovery was put into practice.

The results stated above make the mortality of smallpox, in its natural or unmodified condition, to be 40.24 per cent. Now according to Murchison the mortality of typhus is 17.9. and that of Enteric fever 17.2. These comparisons give one an idea of the fearful devastations, which, in olden time this disease was wont to commit among the people of every nation, not to speak of its frightful ravages, on the beauty of those whose lives were spared in all ranks of society.

It is generally agreed that vaccination is not in all cases a complete prophylactic against smallpox. But this is no doubt to a great extent due to the fact that many who are supposed to be vaccinated, have not really gone through the vaccine disease. The mere story of a patient having been vaccinated is not sufficient evidence that he or she has undergone the vaccine disease. Nor is the mere existence of a cicatrix enough. But if that cicatrix presents to us certain specific characters which we know to belong to vaccination and which I need not here describe then we have a sure proof that the patient has been really vaccinated. Now there is a certain proportion of those truly vaccinated who do take smallpox. And this is doubtless owing to a greater susceptibility of some to the variolous virus, than others. I have often wondered at the escapes from this malady made by physicians, nurses and others, connected with smallpox wards. While dozens of patients bearing upon their arms an indubitable proof of their having undergone the vaccine disease.

were lying with small pox and yet could give not the slightest history of any exposure to contagion. As an instance of this I may mention what occurred to myself. Two years ago, I got small pox under the following circumstances. At the commencement of the season 1860-61, I was revaccinated. I was appointed a dresser in Dr Gillespie's wards. In the month of February. one of our patients had his foot amputated for scrofulous disease of the ankle joint. He took small pox and was sent to the small pox wards. where there happened to be one or two cases at the time. Along with my fellow dressers I took my turn at dressing him. We were all, even if unequally exposed to the contagion. yet, I alone took the disease, to the surprise of my companions, for I was the only one revaccinated and I was also supposed to possess the best constitution.

The same thing happened to a brother of my own. A better specimen of a vaccine cicatrix I never saw, than that which exist

on his arm. He was also revaccinated 2 years ago yet this year he took smallpox, without even being directly exposed to the contagion.

This along with other cases tend to make me think that revaccination is a useless operation, where we have one evidence that the patient has been already well vaccinated.

This notion is also somewhat strengthened by the fact already mentioned, of many only once but well vaccinated, enjoying complete immunity from smallpox throughout life - even although much exposed to contagion.

The only use of revaccination appears to me, to be that of ensuring the first vaccination where it is doubtful, and also ~~to~~ in some to have reflecting, in case any thing should happen.

Much has been said and written regarding the mode in which the variolous poison is conveyed from one person to another. But since this principle is one neither visible nor tangible, we must judge of its properties by its effects. The former practice of inoculation, daily showed that the pus

of a small pock is capable of reproducing the disease when applied to a wounded surface on the body of another person. The virus must therefore reside in this fluid which does not differ in its histological constitution from ordinary pus. Further if we take a scab from the skin of a small pox patient & moisten it with water, and apply it to a broken surface, the same effect will be produced - The virus must therefore be soluble in water.

One case which I have seen illustrates this somewhat. A woman had a brother who took small pox. She washed some of the clothes worn by him during his illness. She had then a slight scratch on one of her knuckles. In a day or two this inflamed, a pustule formed. Then 8 or 9 appeared on the same arm and a few on other parts of the body. In short she was inoculated. The probability is that the water dissolved the virus, and in this way the sore was infected.

Going a step further. I think the most

rational theory, that one can come to is, that the virus must exist in a state of solution in the ~~air~~ aqueous vapour of the atmosphere. This does also appear to be borne out by what I have already shown ~~at~~ in another part of my paper namely, the high rate of the humidity of the atmosphere during the months of the recent epidemic. Thus I would account for the circumstance ~~fact~~, which I have often seen exemplified this session. that people from the ~~&~~ squalid dens of the Cowgate and Canongate are often to be found lying side by side in the same small pox wards with others such as tidy maidservants, from the clean and well ventilated ~~mansions~~ houses of the New Town. from whom I could not, under the most rigorous cross examination extract one item of evidence that they had been, in any way, directly exposed to the contagion. There is no doubt, that the fact, that the small-pox virus has ~~a~~ wonderful power of sticking to garments, will account for many cases of small pox contagion. But even this does not go against my theory for, how did the poison get

on to the garments. and from the garments to the person of the infected. In all probability through the agency of the aqueous vapour in the atmosphere. I have met with one remarkable instance of this property of the small pox virus. A young man a Quarryman at Blakeford. came to the Hospital with small pox, in the month of December. He told me that he had not been in Edinburgh for at least two months before, so that he could not have caught the disease in this way. But he had been working for some time with a man who resided in Edinburgh and who had been in the habit of seeing cases of small pox there. In all probability, therefore, this patient got the disease through the man carrying the poison about his person from Edinburgh to Blakeford. Of course in this matter, I am presupposing the notion that small pox is a disease which is never generated de novo. A theory in which most men believe. but into which I have not time to enter.

Considering the phenomena of variola, in their order, as they appear in the disease, I come next, to the period of incubation.

The only question, which I shall take up under this head, is that of its duration. I have only met with three cases in which I could come to anything like the exact date of the infection.

The first was that of an Irishman, named Thomas Carly. This man was residing in the country and engaged there as a labourer. When on Thursday Nov. 13th 1862, not being able to work on account of the weather, he went in to Edinburgh to see Hallow fair. After wandering about all forenoon, he began to feel cold and hungry. About one o'Clock he entered an eating house in the Grassmarket. While there partaking of some warm broth, he observed a child lying in a bed in the same room in which he sat. He asked the housewife, what was wrong. She told him, that it was her child lying with smallpox. He left the house soon after and walked home. On Thursday the 24th he was seized with the premonitory symptoms of smallpox, and the case turned out to be one of confluent smallpox. This man had not been in Edinburgh for months before

+ No - from end of 13th to end of 27th is 13½
just 14 days, — from afternoon of 13
to afternoon of 27th also just 14 days ½
— yet he took all one morning for 2nd day
— therefore in less than 14 days

In like manner from mid-day 30th July to
mid-day 8th July — just 9 days, not,
or not even 10 days?

the 13th of Nov. nor after it until he came to Hospital. There can therefore be little doubt that he caught the disease in the eating house. If this be the case the period of incubation must have extended over 14 days and a half. for he took ill in the morning of the 27th. This man was not vaccinated. 13.

The next case which is a somewhat romantic one occured in a young woman residing in Dalkeith. This girl had a sweetheat in Edinburgh, who was seized with smallpox, and turned out of his lodgings by his landlady. He went to the Hospital. The young woman remaining true to her lover in his distress, came in from Dalkeith to see him on Friday Jan 30th and also on Friday Feb 6th on Sunday the 8th she was seized with the prelimonitory symptoms of smallpox and on Wednesday the pustules appeared. In all probability this girl caught the disease on her visit to the small pox wards on the 30th of Jan. The period of incubation must in this case have lasted over 10 days. This patient was vaccinated. There were only one or two cases of varioloid in

Dalkeith during the winter, and these were patients, who had caught the disease in Edinburgh, and came out to stay with their relatives during their illness. So that it is not likely that any patient got the infection in this way, since she assured me that she had not heard of a case in Dalkeith but her own.

The third case was that of a servant girl in Albany Street. She had a brother, who took smallpox and who was sent to Hospital on the forenoon of Friday Nov. 28th. She never saw him during his illness but on the forenoon of that day went to his house, to enquire after him, from his wife. On Wednesday 13th Dec. she was seized with the premonitory symptoms of smallpox, which the disease turned out to be. This case is not such a good one as the other two, for there is a possibility that she may have caught the disease elsewhere than in her brother's house, for at that time the epidemic was at its height throughout the town. Still there is a strong probability that this girl was infected in her brother's house and if so the period of incubation must have been 15 days.

The only inference that can be drawn from these three cases, is that the period varies from 10 to 15 days. In order to come to any general conclusion on this point, a very great number of such cases are required. And any conclusion that we can come to must always be more or less subject to one or two very evident fallacies. which I need not point out. Suffice it to say. That from an examination by Craigie of a great many cases recorded by different Observers. the latent period of small pox would seem to vary in duration from nine to eighteen days.

I next come to consider the premonitory symptoms of small pox. and as these constitute a subject, which has received very little attention from Observers, perhaps I will be excused, should I say more about them, than may seem necessary. The premonitory stage of small pox is characterised by the usual phenomena of fever. with one remarkable symptom in addition, namely. a very violent pain in the back. Sydenham speaks of it as "a symptom hardly ever absent, and which does not manifest itself with the same degree of violence

in any of the other febrile disorders, equally severe in their nature, with the single exception of yellow fever".

The first symptom that usually attracts the patient's attention is shivering which does not last longer than 3 or 4 hours. Then comes a headache which in my own case was certainly the severest I ever experienced. The pain in the back then sets in, as a general rule about 12 hours after the rigors. When it is present it is almost always very violent, but sometimes as in my own case it is absent. As a general rule the intensity of the pain is in proportion to the severity of the case in the eruptive stage. A marked weakness of the lower extremities is very often felt by the patient. This was first pointed out by Dr. Warburton Begbie in a review of M. Trousseau's recent work. The Clinique Médical de l'Hotel Dieu de Paris. In my own case I observed this particularly, and I can well remember the great difficulty I had in walking or in going up a stair. Complete paraplegia has been sometimes seen, but I have never met with a such a case.

Convulsions are very apt to occur in children; and in adults more or less delirium is not uncommon. Sickness with vomiting and a sense of uneasiness with pain on pressure, on the epigastrium almost always occur. Very rarely there is diarrhoea. Pain and a sense of heaviness in the chest is sometimes complained of.
I have sometimes been told by patients that they had a great desire to make water and that they made it frequently. Haematuria sometimes occurs during this stage. There is always lassitude & fever is kept through out this stage. Before making any remarks on these symptoms I shall give the history of one or two cases. I may mention, that although I have often watched people complaining of what I thought, might turn out to be the premonitory symptoms of smallpox. I have always, with one exception, been disappointed. So that what I have to relate has been gathered from the history of patients, as told me by themselves. The exception occurred in the case of my brother which I now relate.
Case I. On the evening of Dec 9th he told me that he had not felt well during the day and preceding night. His chief complaint was, that

of a severe headache. I noticed, however, that his face was flushed and his eyes suffused. His pulse was 100 and respirations 30 per minute.
Dec 10th He lies all day with headache. sickness and lassitude, Pulse 115, Respirations 30 per minute.
Dec 11th Remaining in bed. Pulse 120. respirations 30 per minute. Headache lassitude and sickness still continue.
Dec 12th Greatly better, Pulse 800. respirations down to 20 per minute. But one or two pimples are to be seen on his face & chest.
The case turned out to be one of smallpox, which ran a mild course.
Case II. Ann Moonlight, servant aet. 22, admitted on Monday Dec. 15th 1862. She was a native of Aberdeenshire and not vaccinated. States that on Wednesday she was seized with a pain and sense of weight in the chest. This left her on Thursday when she was seized with violent pain in the back. This continued over Friday and Saturday, till Sunday. During this, the pain was so severe that she was blistered for it twice by a medical man of experience in this city. She was feverish throughout

During all this, she never experienced headache nor weakness of the legs. But she told me that she was very hot and feverish. I shall relate the rest of this case in another part of this paper. but the eruption made its appearance on Sunday night. The case turned out to be the severest I ever saw and terminated fatally.

Case III. Donald Kennedy, letter carrier, aet 23. admitted Thursday Dec 4th. Patient has some dim recollection of being vaccinated when a boy. but there is no cicatrix to be seen on either of his arms. He states that on Saturday night he felt a severe headache which continued over Sunday, Monday and Tuesday. On the two latter days he was able to perform his duties as a letter carrier. but he complained of great weakness of his legs. On Tuesday evening he observed the eruption. but he never during all this complained of pain in the back. This case turned out to be one of confluent smallpox from which he recovered. He was making a slow convalescence, when one night he was attacked by a fit of convulsions. In a day or two he had paralysis and died comatose.

Case IV. Mr Gunn. Medical Student.
Vaccinated with distinct cicatrix. Came into a private ward in the Hospital on Nov 17th. He told me that on the evening of the Wednesday previous he felt unwell. He had shiverings and a headache. Next day he went to College, but was obliged to go home again, without entering a class room. He had a severe pain in the back, which he said was exactly in the region of the Kidneys. He had also a great desire to make water and he made it frequently. On Thursday night he became delirious. Drs Begbie & Gamgee, who saw him in this state told me that the delirium was wild and violent. He became conscious on Sunday morning when the small pox eruption appeared. Mr Gunn remarked before the delirium came on that he had a very rapid pulse, great feverishness, with throbbing at the temples. The disease turned out to be one of discrete small pox which ran a mild course.

Case V. Thomas Carly, Irishman. not vaccinated took ill on Nov 27th. His Symptoms were pain in the back and sickness. and he told me that when

he tried to walk, he felt on his legs as if he were drunk. The case turned out to be one of semiconfluent smallpox.

Case VI. Christian Kennedy aet. 20. vaccinated admitted Jan 22nd states that on the Saturday previous she was seized with shiverings and headache. On Sabbath she had pain in the back. On Monday this continued along with a pain in the chest & and difficulty in breathing. For this her medical attendant put a blister on the chest. These symptoms continued over Tuesday but they all left her at the commencement of the eruption, which took place on Wednesday morning.

Case VII. Peter Johnson aet 16. Groom, was seized with ~~[illegible]~~ headache and pain in the back on the morning of Saturday Nov. 15th He was very hot & feverish and was sent in to the Hospital, by a distinguished medical ~~[illegible]~~ practitioner in this city, as a case of continued fever. The smallpox eruption appeared on Monday, however, and the case turned out to be one of fatal confluent smallpox.

From a consideration of the symptoms

presented by a patient in the premonitory stage of smallpox. one cannot but come to the conclusion. that these constitute a condition of distinct fever altogether independent of any local lesion. All the internal viscera seem liable to be more or less affected by it. The severe cephalgia is, I have no doubt, owing to a condition of blood hyperstasis in the brain, and thus we have occasionally, convulsions, delirium. throbbing in the temples, pulsation in the ears. and a feeling of giddiness. The pain which sometimes occurs in the chest, is in all probability due to a similar condition in the lungs. and so we have along with it a sense of heaviness in the chest, and difficulty of breathing. indeed cases are on record where haemoptysis had occurred in the premonitory stage of smallpox. The nausea. vomiting, uneasiness about the epigastrium, and pain increased on pressure, is doubtless but a form of mild gastritis. But I have some thing more to say about that most marked phenomenon. namely, pain in the back. This has, usually, been looked upon as a muscular pain or lumbago. But if examined carefully, this will hardly appear

to be the case. For lumbago does not always affect the same part of the back; in one case it will be found running along the track of the great longitudinal muscles of the spine. While in another, it strikes the muscles which run obliquely from the spinal column. But the pain in the back in small pox is always to be found at one and the same spot, namely, on a level with the junction of the dorsal and lumbar vertebrae, and extending a little to the side. In at least fifty cases, I have asked patients to put my hand on the place where they felt the pain, and without exception it was uniformly as I have stated.

Trousseau in his recent work, looks upon it as depending upon a condition of the spinal cord itself "and of this" says he "we have the proof in a considerable number of cases. Last year in the space of a few days, I was enabled to show you two examples of this lumbar pain, accompanied by paraplegia. Sometimes the paralysis affects the bladder. Patients have retention of urine, at least a marked dysuria. Ordinarily of brief duration. These paralytic

accidents sometimes continue to the ninth or tenth day of the disease, more frequently they cease with the development of the eruption."
Whatever may be the correctness of this theory it has certainly not been sufficiently brought out by European. The pain in the back and the paraplegia do not appear to me to be so intimately related. How rarely do we find paraplegia, while the lumbar pain exists in a greater or less degree of intensity, in the great majority of cases. Nor does this pain seem to bear any relation to the weakness or partial paralysis which I have mentioned above as occasionally affecting the legs. for the former may exist in the most violent form, without the latter being present at all and vice versâ.
I would likewise urge the same objection to this theory as to the former, namely the region of the pain. Were it spinal it would be found along the track of the spinal column sometimes, perhaps, at one point, sometimes at another. but as I have shown the variolous pain is always at one spot. Many of the other symptoms of spinal irritation are likewise

never to be found. such as, for instance, spasms. formication. tingling, numbness &c. I believe that occasionally the spine may be affected giving rise to partial loss of power of the limbs and as in one case, at least which I have seen, a spasmodic affection of the legs. This in all probability depends upon a hyperhaemic condition of the spinal cord. and may in many cases give rise to more or less pain of a certain kind.

What then does the pain in the back in Nicola depend upon? I think the most reasonable answer that I can give, is, that it is owing to a condition of the kidneys; not an inflamation but merely a blood hyperstasis in these organs. Now, there was no one who could observe and describe symptoms more accurately than Sydenham. and he speaks of it as an acute pain "very like a nephritic paroxysm" My friend Mr Gunn when he took small for. thought that there was something wrong about his kidneys. The girl Moonlight's case seemed to have been mistaken by her medical man, for one of acute nephritis. for she was

treated for that malady" secundum artem".
I can conceive no other way of accounting
for the character of this symptom, than by
supposing that it depends upon the kidneys.
Thus we have that pain always occupying one
position and that exactly over the region of
the kidney, namely, at the junction of the lumbar
with the dorsal vertebrae extending a few inches
on each side of the spine. Thus, too, I would
account for the frequent desire of the patient to
micturate and also for the haematuria which
is well known, sometimes to occur in this disease
during the premonitory stage.
With regard to this point a question naturally
arises, why should the pain in the back be
so marked in small pox? Now if the theory
which I have ventured to propose be correct
I think we may at least approximate to
some solution of the question. We know that
there is a lapse of time between the reception
of the virus into the body and the period at
which the patient begins to be disturbed.
During this the poison would appear to hatch
itself and become enormously increased in quantity.

Nature, according to a doctrine of the old humoral pathology which has been of late set revived, then makes an attempt to relieve herself of this morbid material. but in doing so a disturbance is created.
The channel through which the poison must leave the system is the skin. and it as a day or two before this channel begins to be opened up. Meanwhile, the poison circulates through the excited system and one or two of the internal viscera may as I have endeavoured to show, assume a hyperhaemic condition. The organs most liable to this state are the kidneys, which of all others are the most important as excretors of morbid matter from the blood. But the renal organs and the skin are intimately united in their physiological relations. They are indeed often to a greater or less extent vicarious of each other. But it is the skin which is to excrete the variolous poison, and before doing so, an attempt has been made by the kidneys to perform the same act. ~~Or rather~~ in other words to eliminate the variolous poison then circulating

Nature, according to a doctrine of the old humoral pathology which has been of late set revived. Nature makes an attempt to relieve herself of this morbid material. but in doing so a disturbance is created.
The channel through which the poison must leave the system is the skin. and it as a day or two before this channel begins to be opened up. Meanwhile, the poison circulates through the excited system and one or two of the internal viscera may as I have endeavoured to show. assume a hyperhaemic condition. The organs most liable to this state are the kidneys, which of all others are the most important as excretors of morbid matter from the blood. But the renal organs and the skin are intimately united in their physiological relations. They are indeed often in a greater or less extent vicarious of each other. But it is the skin which is to excrete the variolous poison, and before doing so, an attempt has been made by the kidneys to perform the same act. ~~Primarily~~ in other words to eliminate the variolous poison then circulating

in the system - Thus I would explain the pain in the back, along with the other renal symptoms which we positively to exist.
know

There are numerous questions which might be discussed in connection with the eruptive stage of variola. I have only time however to take up one or two - and first as regards the nature of this stage - I think the correct way of looking at it is that of its being a local disease - It does appear to me to be a local disease as much as any abscess is local - and whatever may be the amount of constitutional disturbance this is entirely owing to the local lesion - The poison seems to have left the blood and to have localized itself in the skin, there giving rise to a pustular eruption - It does not appear that the formation of pus is necessarily connected with the existence of the poison in the skin for we have good evidence, that before the pus is formed the poison exist is present in the papules or vesicles, from which we can propagate the disease by inoculation -

It is interesting to observe the manner in which the constitution becomes affected by the eruption. At its commencement and after the patient has suffered pretty smartly from the premonitory symptoms, he often tells us that he feels quite well. So much was this the case with my self when two years ago I took smallpox, that on the morning in which the eruption appeared I felt so well that I resolved to get up out of bed where I had been lying for two days and go to college. But on stretching out my hand to draw on my trousers I noticed a pustule or two upon my wrist, and on examining myself I found about a dozen more. It turned out that I escaped through a pretty smart attack of discrete smallpox. But gradually as the eruption goes on the patient becomes more feverish and the febrile excitement is at its height during the maturation of the pustules

But much has been said and written about the secondary fever that takes place in unmodified smallpox. With a view to

satisfy myself on this point, I have examined and taken notes of, a good number of cases. But relating them here would only encumber this paper. So that I shall content myself with stating my conclusions.

I believe that there is no essential difference between modified and natural smallpox as regards secondary fever and that this fever is always in proportion to the severity of the case, whether modified or natural. But as modified cases or cases in which the patients have been properly vaccinated, are never severe, it follows that there can be no marked secondary fever. Nevertheless in all ordinary cases, either of modified or of natural smallpox ~~of the discrete variety~~ there is a gradual increase of the febrile disturbance from the time that the eruption appears up to the period of suppuration. And it is seldom that in well marked cases of modified smallpox and at this period. That the pulse is below 100 it is very often up to 100 or 130. In two such cases I have seen that peculiar delirium which we know to belong to smallpox, take place.

Further I hardly think that this secondary fever

is entirely owing as it is usually stated to suppuration taking place in the pustules. This is no doubt a great cause, but at the same time I cannot but think that it is owing to a great extent to the skin all around the pustules being in a state of irritation. In my own case this irritation which was at first very painful and then itchy entirely prevented me from sleeping without the use of opiates. The fever may be most severe before the pox begin to suppurate. In the severest case I ever saw that of Ann Moonlight not only was the pulse up to 150 but the patient died before a particle of pus was to be found in any of the pustules. I examined about a score of them on various parts of her body and found it as I have stated.

The next point that I shall take up is the state of the urine in smallpox. I have examined daily and kept records of the condition of the urine in 33 cases of smallpox. In its general characters the urine does not differ from those of the

urine in ordinary febrile disease. The specific gravity as a general rule ranges from 1019 to 1027. In one case I found it remarkably low ranging from 1006 to 1009. but without being able to discover anything remarkable in the patient in whom this occurred. In the majority of cases the urine is alkaline but in a good number it is acid or neutral. During the progress of the eruption the chlorides are always deficient while the lithates are very abundant. and as a general rule there is an excess of phosphates during the maturation of the pustules. In very bad cases the phosphates become mixed with mucus, forming a peculiar tenacious mass which is usually found floating upon the surface of the urine - from 24 to 36 hours after it is passed.

But the question of most interest is the occurrence of albuminuria in smallpox. Concerning this point Trosseau says "albuminuria is a complication of the disease and it is nearly as frequent in confluent variola as it is in scarlatina. There is however ~~a~~ this difference that in

Scarlatina the albuminuria appears during the decline of the disease, while in variola it occurs at its height." Dropsean then tells us that he is indebted to M. Abeille for this observation. Abeille recently issued a work on the urine in different diseases. In that part of it where variola is treated of, he says "We have searched for Albuminuria in 17 well marked cases of variola and found it in only one. It was a case of confluent variola. It was noticed at the commencement of the eruption and continued five days. The urine was sedimentary and strongly acid. The flocculent precipitate obtained was slightly coloured. It was the only confluent case in the 17." It will be seen that Dropsean was not entitled to form any conclusion on this point, from the data laid down by Abeille. for although that observer did find albuminuria in confluent small-pox, still he only examined one case of that variety of the disease.

When examining the urine of patients, during the recent epidemic, with a view to determine

this point I was always careful to select the severest cases that were to be found in the wards. Accordingly out of the 33 cases which I examined 15 were confluent. Out of the whole I only found 2 cases in which albumen occurred.

As these two cases were somewhat remarkable I shall give a short account of them.

Case I. James Dick aet 37. This man was a patient in ward 4, Medical House, labouring under general paralysis. On Tuesday Nov. 18th he complained of severe headache after this he could take no food, and vomited a good deal. On the Friday morning while the nurse was sponging him she observed an eruption. Small-pox was at once suspected and he was sent off to a smallpox ward. I examined his urine that day and found that besides the usual excess of lithates, it was very highly albuminous. Dr. Arthur Gamgee resident physician to the No. 4 ward, assured me that no albumen existed in this man's urine previous to the attack of smallpox. The patient died on Tuesday Nov. 25th and his

urine remained albuminous to the last.
In the dissection it was found, that the brain was rather congested with serum in the ventricles The lungs especially at their bases were in an ecchymosed and oedematous condition. The Spleen, liver but especially the Kidneys were very much congested.
Case II. I have already referred to this case. it was that of Donald Kennedy who had a severe attack of unmodified small pox of the ~~confluent~~ confluent variety. by which both his eyes were destroyed. I examined this man's urine every day until he became convalescent and failed to detect the slightest trace of albumen. Dr Arthur Gamgee to whom I submitted the urine once or twice for examination, came to the same result. The patient, however, was making a slow convalescence when about a month after his illness, he was seized one night with convulsions. they returned and at length he became paralytic and died comatose. His urine was examined when the fits came on, and it was found highly albuminous. and remained so till his death. This can hardly be said to be a case of albuminuria in small pox.

The albuminuria probably depended upon organic disease of the Kidneys occurring as a sequela of Smallpox.
The proportion of cases in which I have found albuminuria is therefore 1 in 33. or 1 in 15 of the confluent variety. And there can be no doubt but that in the case in which I detected it, the albuminuria was in some way connected with the paralytic affection. Bechguell found it in 1 out of 21 cases which he examined. Albuminuria must therefore be considered a rare complication in smallpox during the eruptive stage of the disease. Much rarer than Trousseau seems to suppose.
But since I believe that in the premonitory stage there is a kidney affection, I would not be surprised to learn that albuminuria does occur not unfrequently during this stage. My suspicion is strengthened by the fact that haematuria occasionally occurs before the eruption appears.
I have often examined the urine of patients in the General wards, where from their symptoms there was a suspicion of smallpox coming on. But as my suspicions or rather prognosis

never turned out to be correct, my labours were in vain.

I should have liked very much to have been able to say something about the ~~treat-~~ morbid ~~ment~~ anatomy of smallpox. but ~~un~~fortunately ~~for me~~, very few bodies were opened. Indeed I have only seen one sectio cadaveris of a smallpox patient during the whole epidemic.

I shall, now only take up one or two points in the treatment of smallpox. before finishing this paper.

One of the characteristics of the present age is that of a strong desire for novelty. and it need not be a matter of surprise, that every now and then the medical profession are startled by the announcement of certain infallible remedies or specifics for disease, over which we had formerly little or no control, thus within the last six or eight months, we have been told that a specific has been discovered for smallpox, and that a decoction of the leaves or root of the Sarracenia purpurea was the drug which possessed this property.

This drug was ushered before the world as "the great anti-variolous remedy and elixir for suffering humanity". Bitter were the disputings, as to whom belonged the merit of having first introduced this remedy. and as to who was the first to import it into this country. It is not for me to enter into the questions involved in those disputings, ~~and that~~ more especially as I think that Sarracenia purpurea will shortly sink into oblivion at least so far as smallpox is concerned. Suffice it to say that this plant has been long in use among the North American Indians as a remedy for smallpox. and that it was lately alleged to possess the property of cutting short the disease almost at once.

I was kindly permitted by Drs Begbie and Haldane to make a trial of it in their wards. and the latter gentleman ascertained that the drug I was using was genuine. I selected the worst cases that were to be found for the purpose. I administered it according to the directions of Assistant-Surgeon H. Chaldmers Mills R.A. who I really think brought

it first before the notice of the profession. As I was then very frequently in the wards. I saw that the remedy was given as soon as possible and also that it was taken regularly by the patient.

I have before me the notes of five cases. which I shall relate very briefly.

Case I. Peter Johnson aet. 16 admitted Nov. 15th not vaccinated, got Sanaccenia on the afternoon of the day in which the eruption appeared. He took it as long as he was able. The case turned out to be a very severe one of Confluent Smallpox. The patient died on the 28th Nov.

Case II. John Mc Donald admitted Nov. 19th not vaccinated. Got Sanaccenia throughout his illness. The case was one of confluent smallpox. The patient died on the 3rd of December.

Case III. Donald Kennedy admitted Dec. 4th not vaccinated. He took Sanaccenia throughout his illness. The case was one of confluent Smallpox with the total destruction of both eyeballs. he recovered. but only to die a month the after in the way I mentioned in another part of this paper.

Case IV Anon Moonlight aet 22. admitted Dec 15th

not vaccinated. Began to take Sanaccenia purpurea shortly after the eruption appeared and continued taking it as long as she could swallow. The case was a most severe one of confluent smallpox and proved fatal on the 3rd of December.

Case V. Mary Fitzcharles admitted Nov. 28th not vaccinated. She took Sanaccenia throughout her illness. This patient recovered but the disease was only semi-confluent.

Thus of 5 cases in which Sanaccenia was used 3 were fatal and a fourth may be safely said to have died from smallpox.

I have conversed with several practitioners who have also tried it. They also failed to see any good effects whatever from its use.

It does no good as I have shown but at the same I dont believe it does any harm, which is more than can be said for some much vaunted specifics. With the view of determining its physiological action if it had any, I got some of the decoction as prepared by Messrs Duncan & Flockhart. I took 2 ounces of the drug three times daily for three days. But I did not feel the slightest effect, not even that of a diuretic.

We must therefore content ourselves at present with the ordinary constitutional treatment of confluent small pox. which is simply that of continued fever.

I can say little about the ectrotic treatment of this disease. Among the many inventions which have been tried for this purpose. that which seems to me to be the most rational, is the one introduced by Mr Stanley Haynes. a fellow student and intimate friend of my own. It consists simply in applying a solution of India rubber in chloroform. to the pustule. The chloroform evaporates and leaves a coating of India rubber. which. as the face swells. does not crack. but on account of its elasticity expands and thus effectually prevents the entrance of air.

This plan was only thought of a few weeks ago. and since then I have not fallen in with a case of confluent small pox. upon which I might try its effects.

On account of the remarkable tendency of the vesicular eruption to spring up in the seat of old cicatrices. or on any part of the surface of the body where there happens to be an irritation or increased vascularity of the surface - it has

been suggested, that the production of an artificial irritation, might draw the pustules from the face to the part irritated and thus prevent pock pitting.

The plan proposed is to put a blister on any convenient part of the body, where the pitting will not be seen. This of course must be done as soon as possible, before any, or at least very little of the eruption is out. I have met with three cases in which the patients were blistered before the emption appeared. One was blistered for a pain in the chest, another severely for the pain in the back. a third was blistered on the chest by my orders just when the eruption was beginning to appear. In all these cases not the slightest benefit seemed to accrue from the treatment. In one case which was that of the girl Moonlight who was blistered severely on the back I even thought that there were fewer pustules on the blistered part than on the surface around. and certainly there was no improvement on the face, for it was the worst I ever saw. In the beginning of November a man came into the Hospital with smallpox but at the same time he was labouring under a virulent gonorrhoea, which had been going

on for some days before he was seized with the premonitory symptoms of smallpox. In this case the penis was covered with pustules more thickly than any other part of the body. It would seem therefore from this and other such cases, that the inoculation in order to produce any beneficial effect must exist previous to the commencement of the premonitory symptoms. if so the suggestion is practically of no use.

With regard to all the remedies that have been employed, in the treatment of the variolous disease. I do believe that they would very soon be rendered useless or unnecessary were a proper system of compulsory vaccination established and I further think, that, if such a system were universally enforced, the disease smallpox would no longer be classed in the category of human maladies; it would only be found in the pages of history or in the records of Antiquity.

Walter Reid