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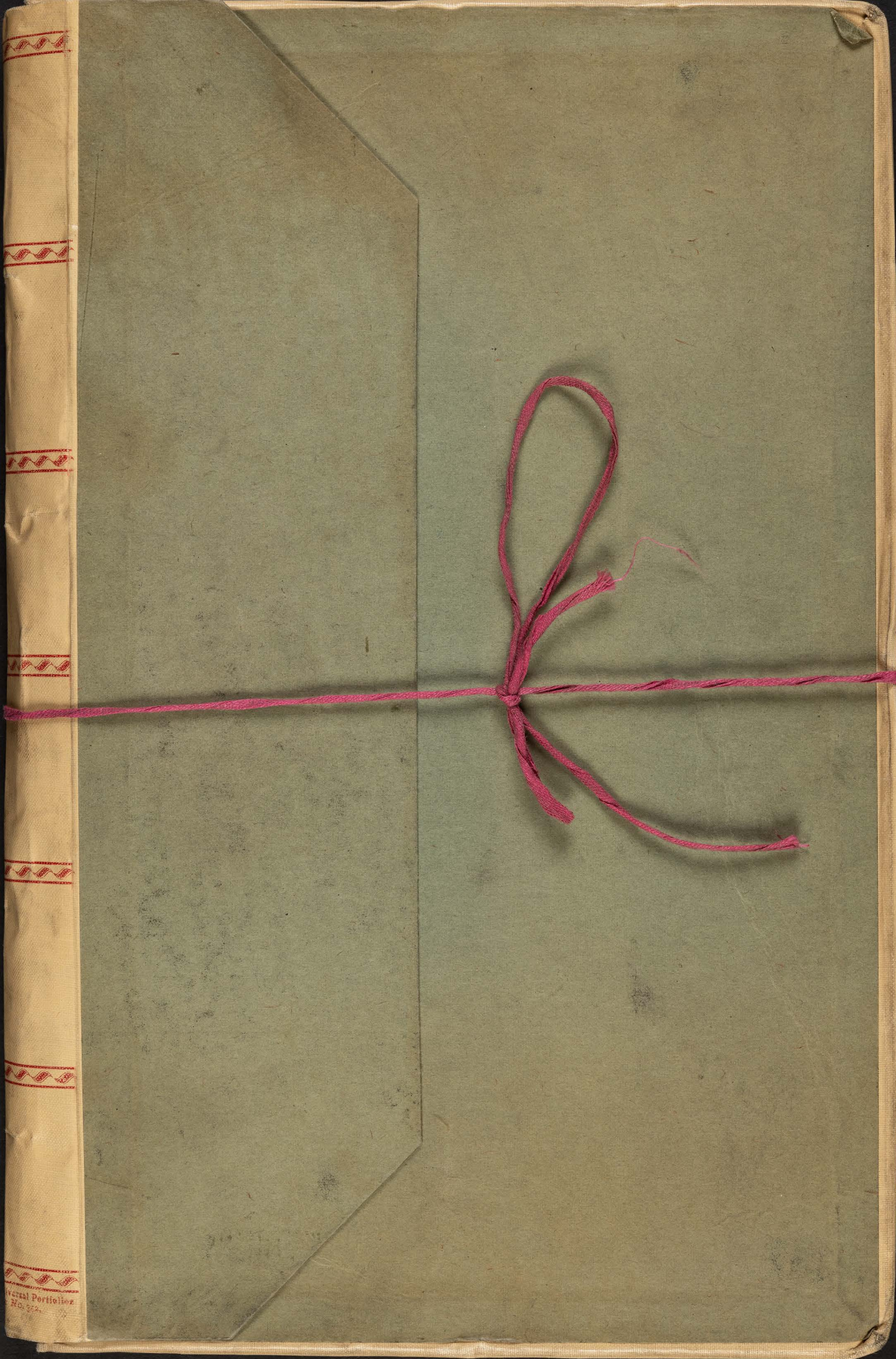
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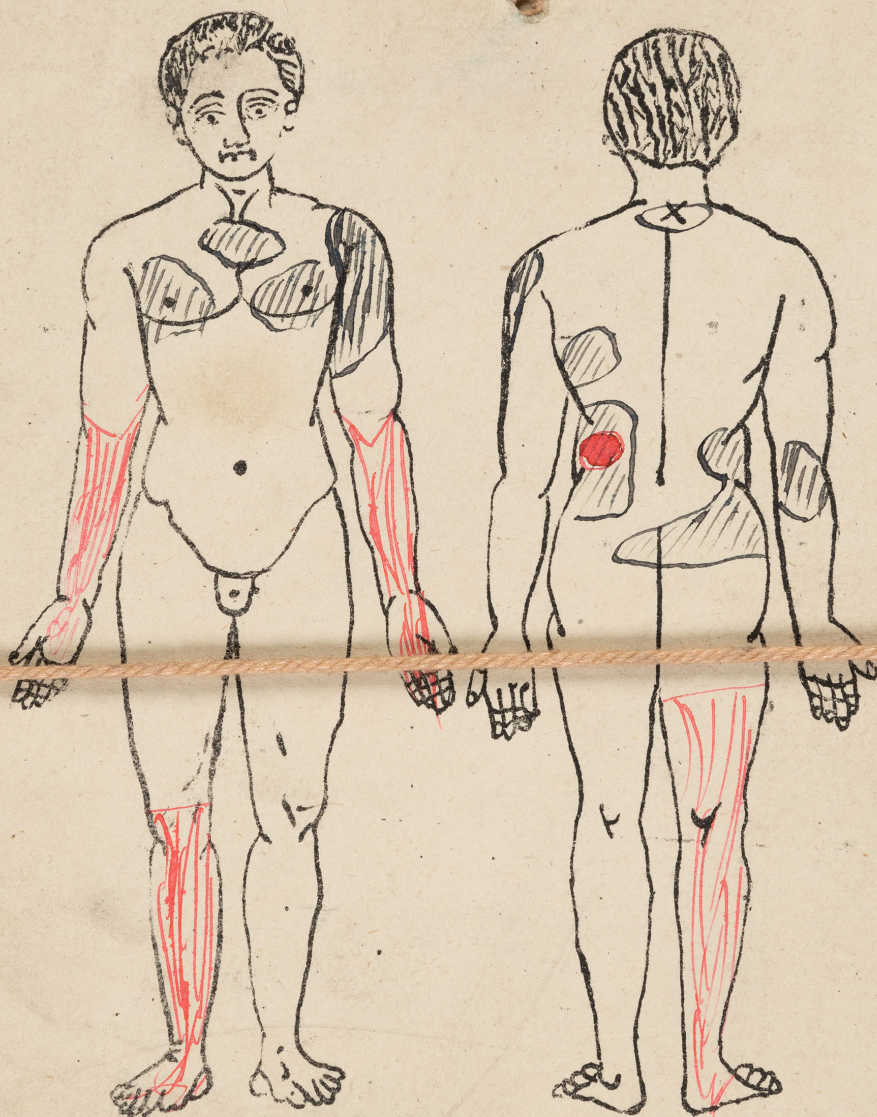





Universal Portfolio  
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Baldewa Kampar p 59 of Dec '05

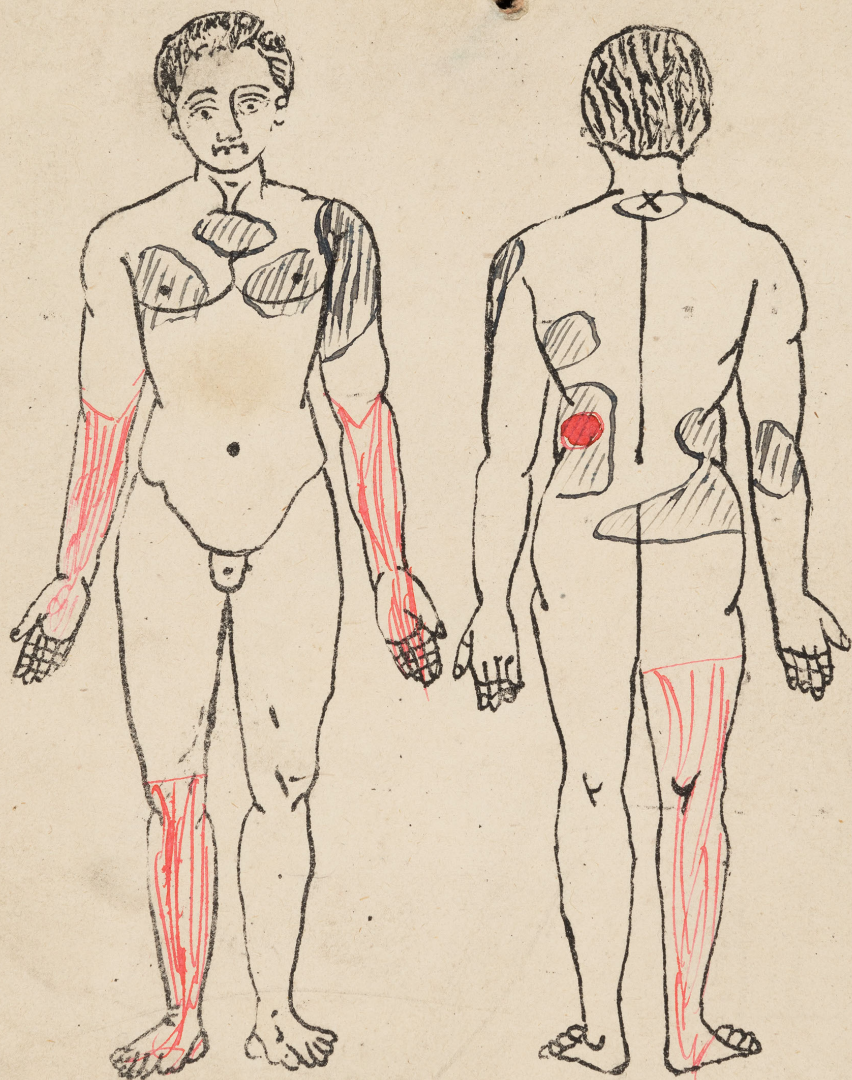



Pale maculae .... 

Anaesthesia .... red



Baldewa Kumpar p 59 of Dec '05



Pale maculae ... 

Anaesthesia ... red



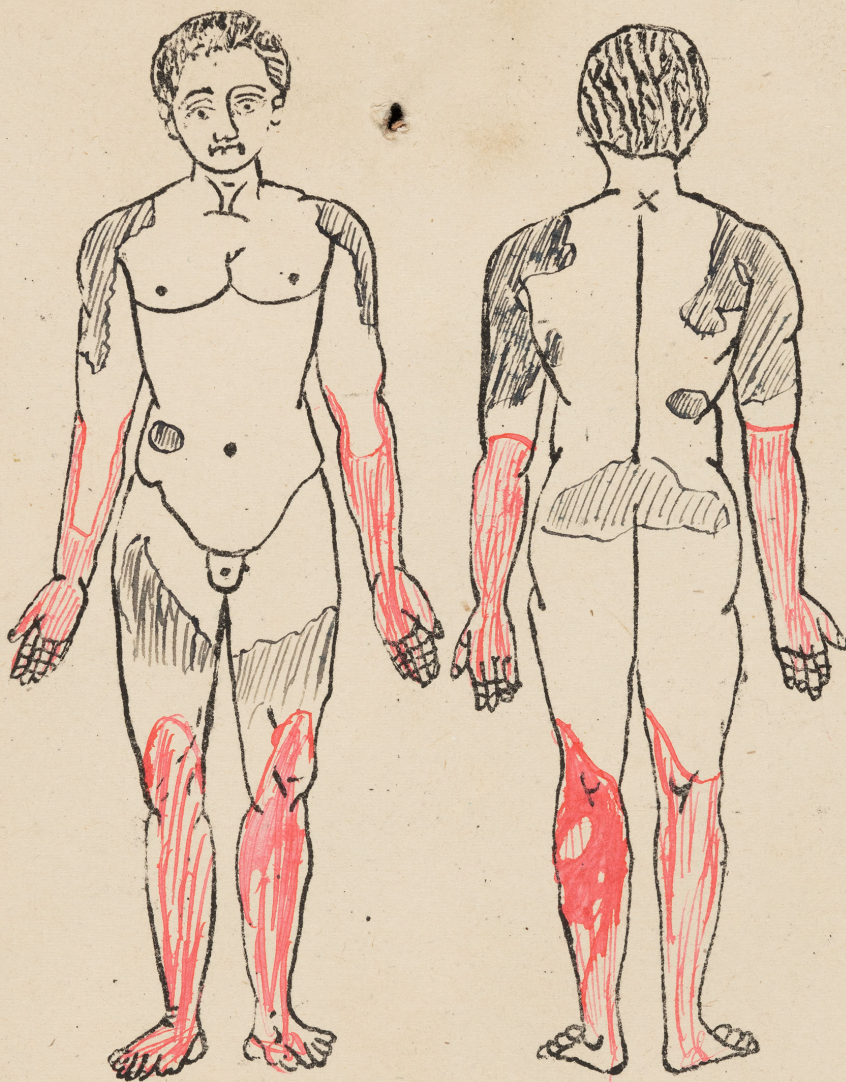
1

thesis : Leprosy

Thurber



Habi Bakliet p 53 of Dec 1905



maulal



Anaesthesia





Thesis : leprosy

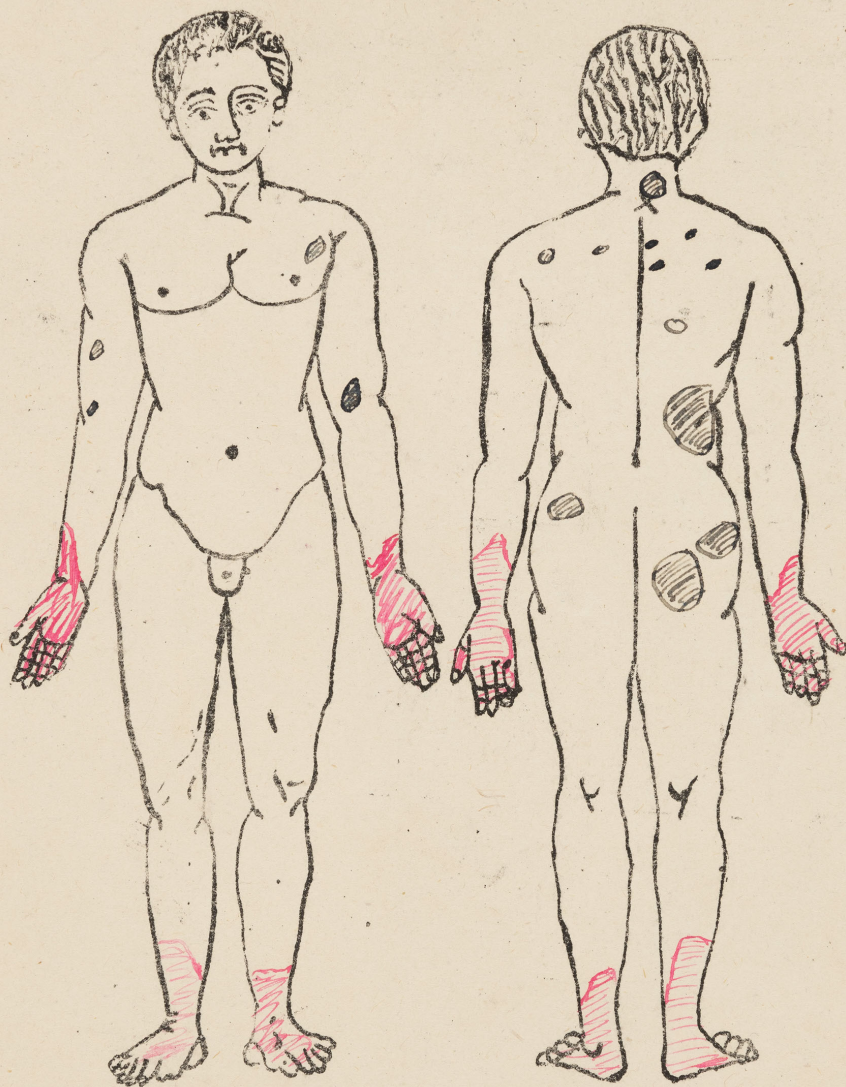
Trunk



Barkai

Page = 153

9.11.06



Maculae

Anaesthesia in red



3

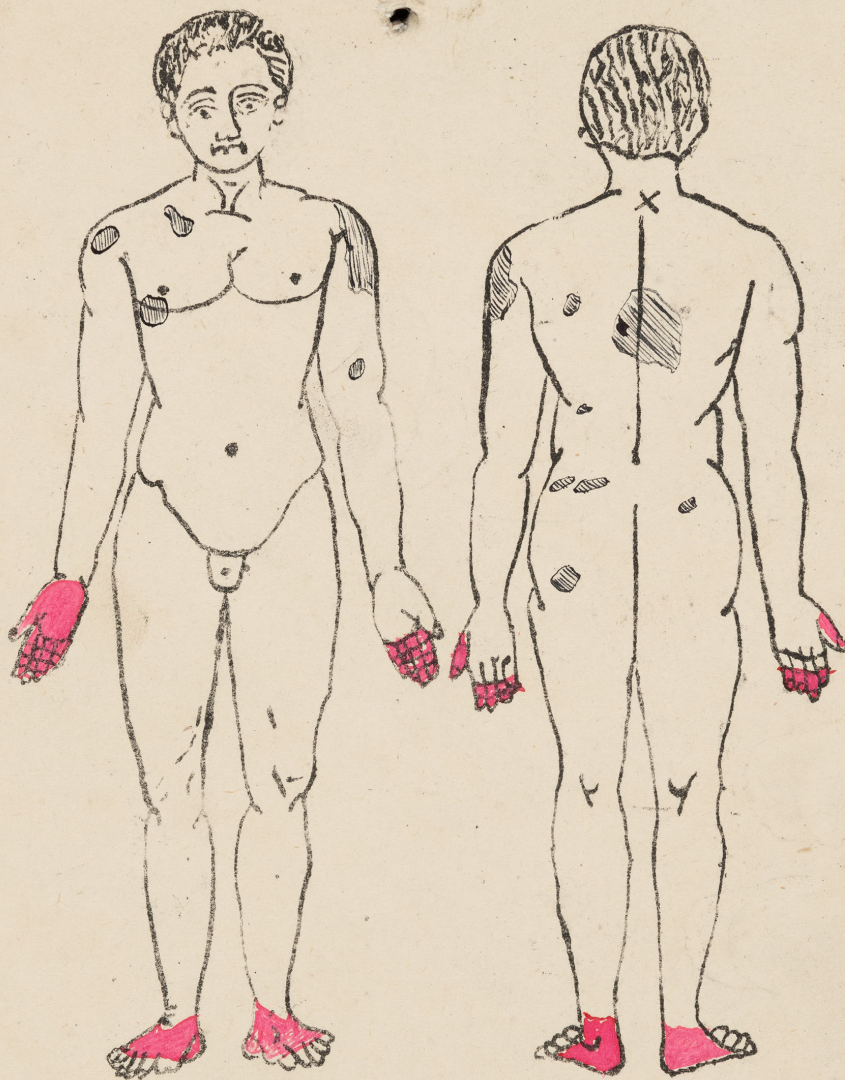
thesis : Leprosy

Thurber



Hari

Admitted to leper block.  
Sketched 15<sup>th</sup> Jan 1907



Maculae in black. Distinct, pale, clear outline. Pass  
directly into normal skin  
Anaesthesia Red



Thesis: Leprosy  
Tuberculosis

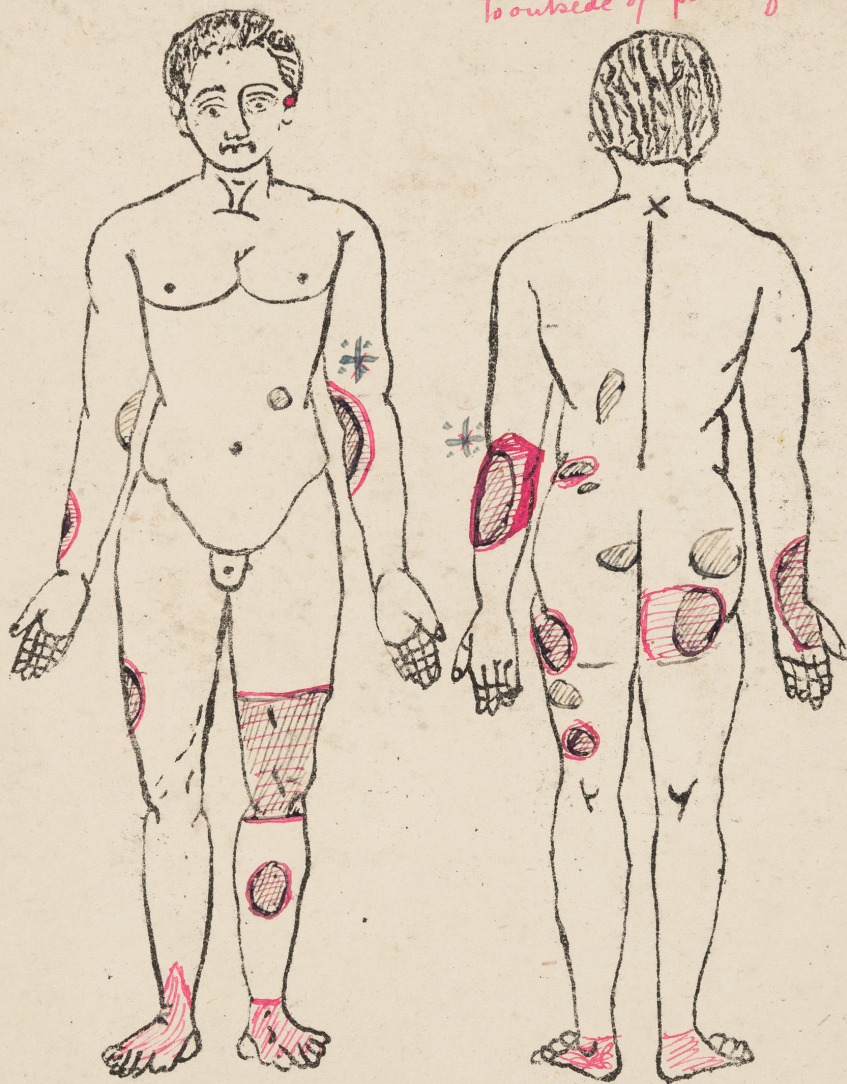


hurli

Page 147  
24.10.06



Healing skin between two maculae  
to outside of point of elbow is anaesthetic



Maculae   
Anaesthesia in red



5

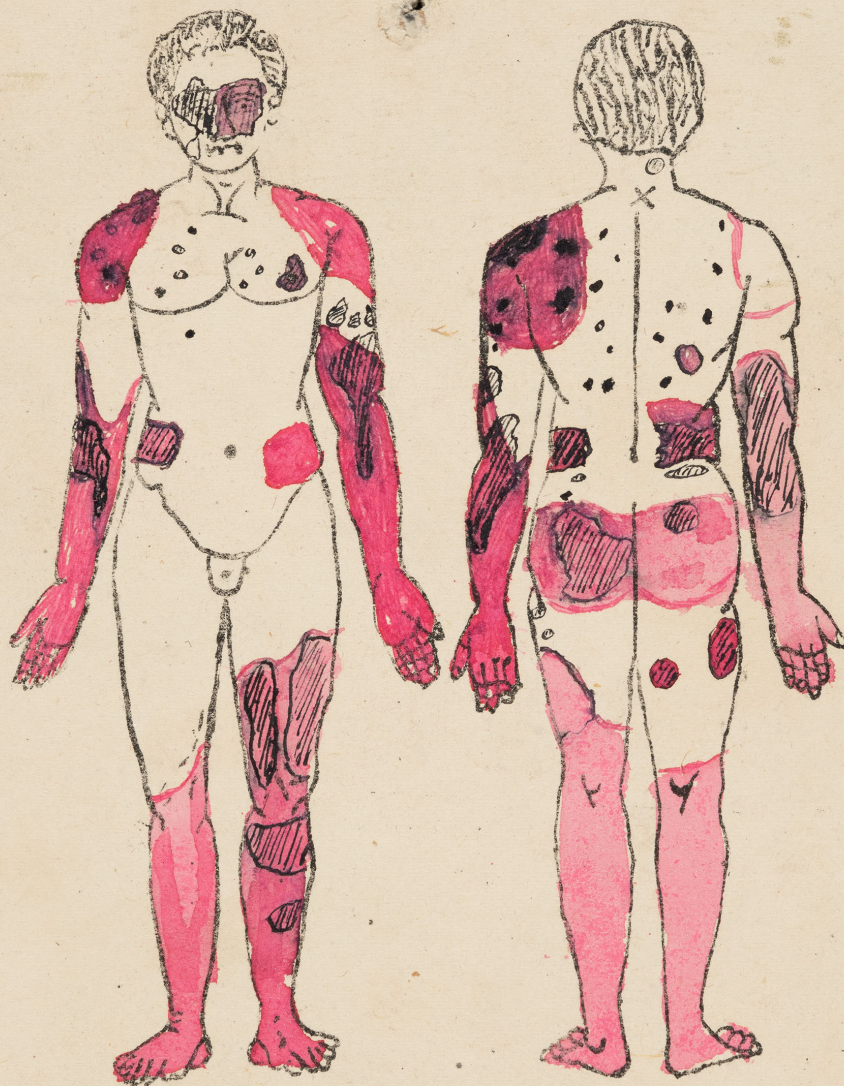
Thesis : Leprosy

Thurber



Urm Singh

Admitted to leper block  
sketched 15.  $\frac{1}{07}$



Anaesthesia Red  
maculae outlined in black  
lued thers



6

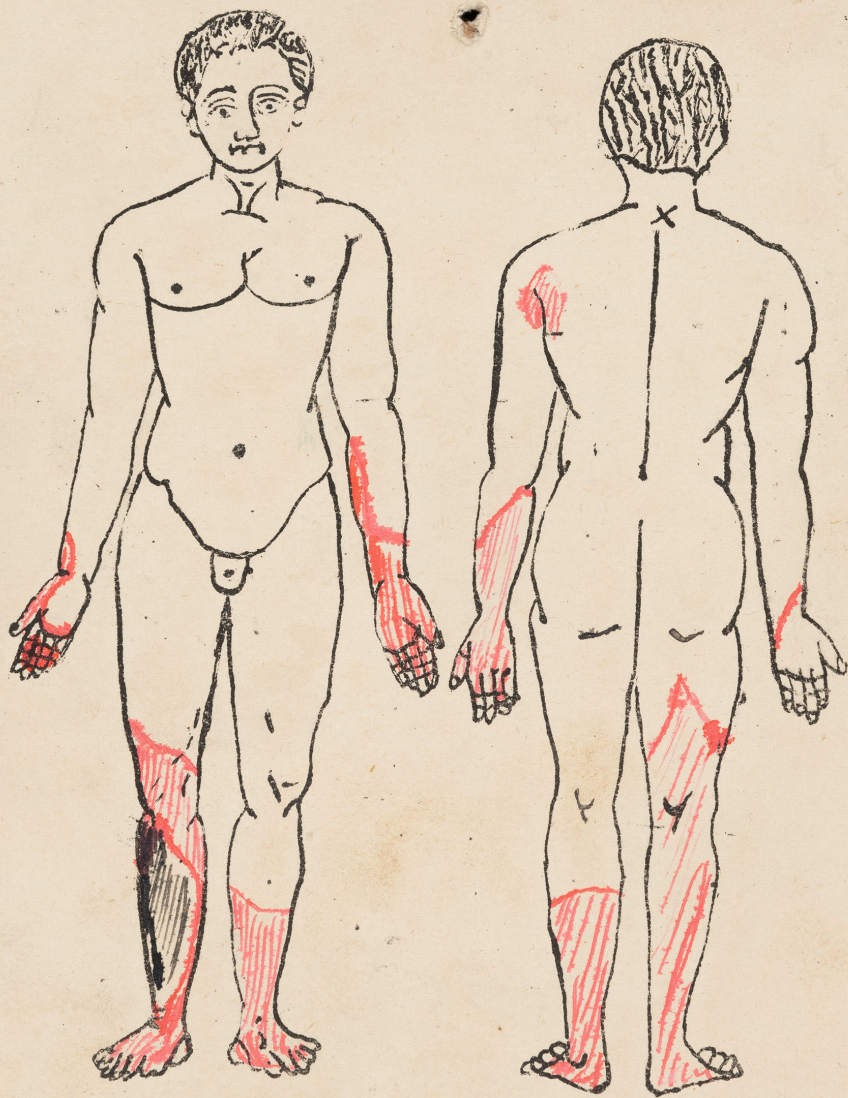
Thesis : Leprosy

Thurkel



ho 143

Latium 5<sup>10</sup>/<sub>86</sub>



Trunk covered with pale maculae of vesical  
and not anaesthetic  
anaesthetic area in red.



7

thesis : Leprosy

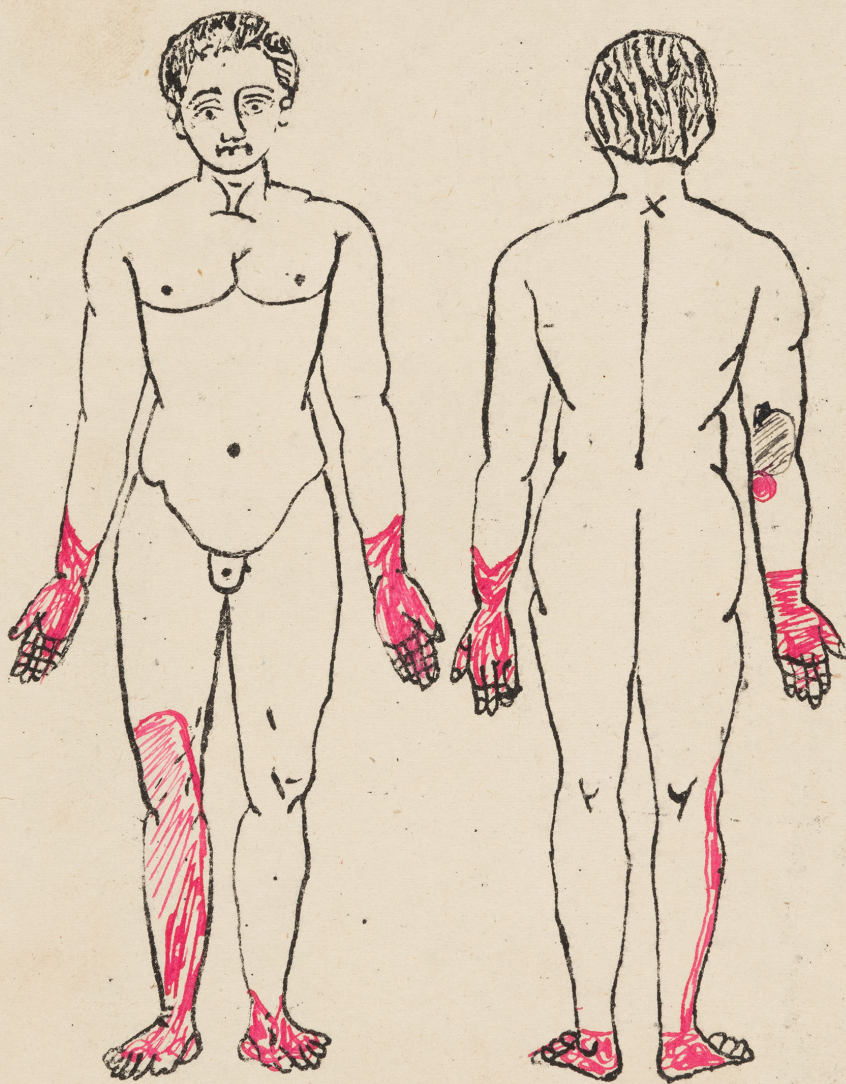
Trinibel



Daulat Singh

2

15.9



Maculae

Anaesthesia in red



8

Thesis : Leprosy

Thunel



Ram Datt

131

maculae not anaesthetic  
in black

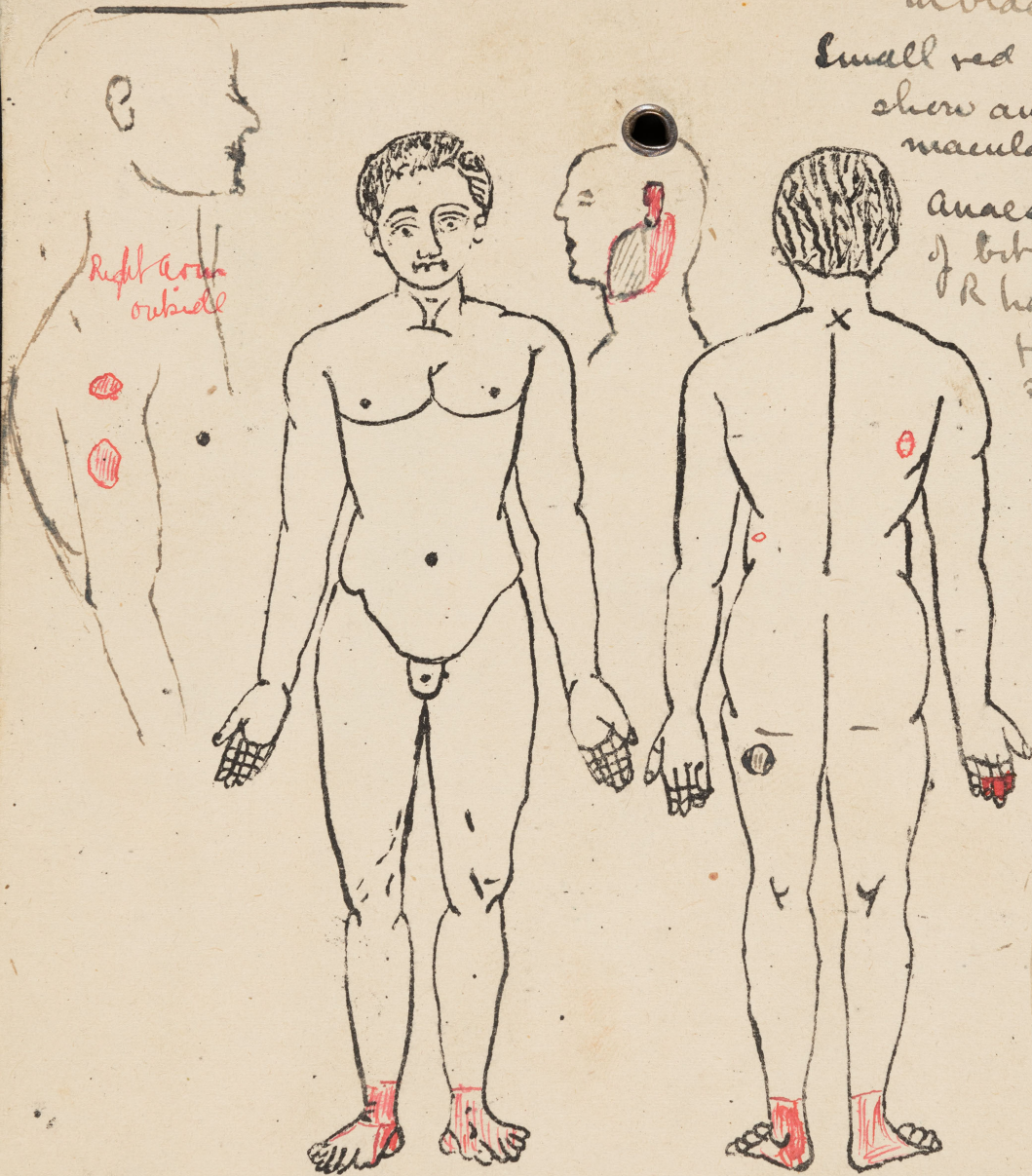
Small red circles  
show anaesthetic  
maculae

anaesthesia also  
of bit of fingers of  
R hand & of  
feet as  
shown. Here  
no maculae

Right arm  
outside

Left thigh  
outside

Soles normal





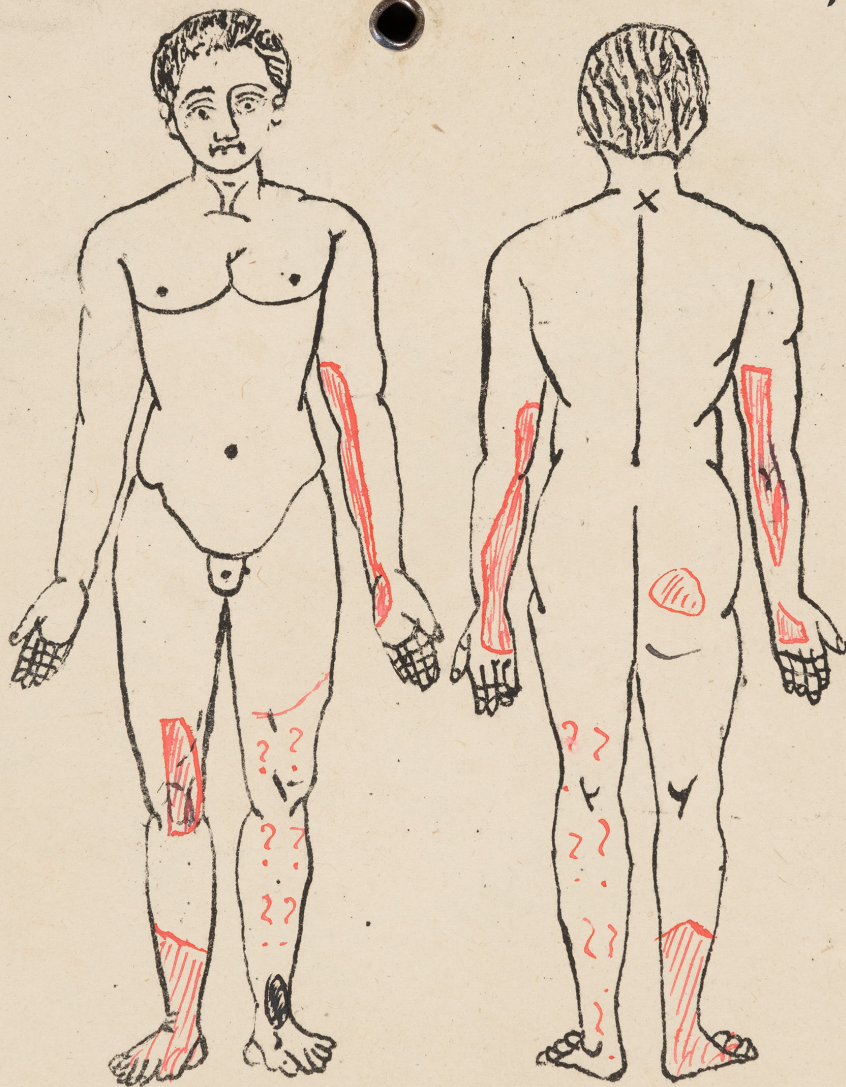
Thesis : Leprosy

Thurber



Karimullah ho 370 g 1905

7<sup>2</sup>/<sub>2</sub>



History of numerous maculæ. Only one now  
remaining is in front of L. ankle  
Anaesthesia in red



Thesis : Leprosy

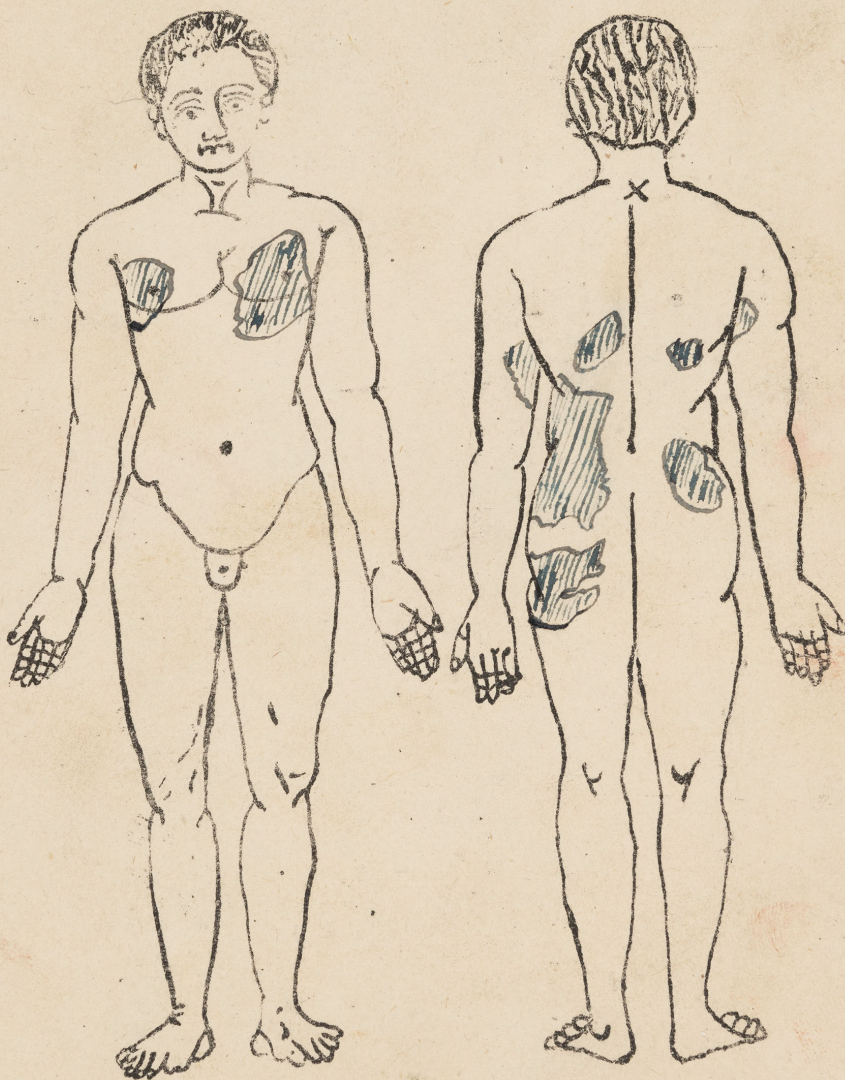
Thinks



Dharma



~~The *maculae* patches~~  
maculae no one anæsthesia



maculae. (C)

no anæsthesia of maculae or other part



Thesis : Leprosy

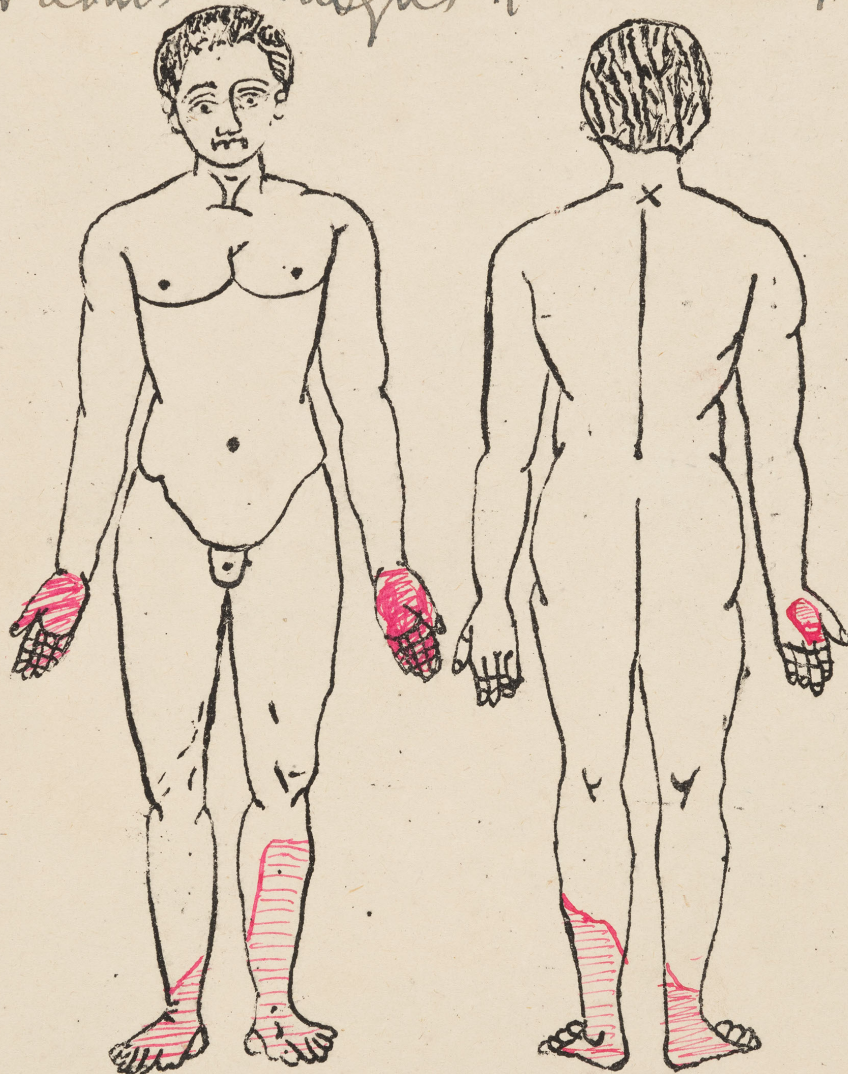
Trunkles



- Moti.

Page 149  
- 27.10.06.

maculae consisted of diffuse mottling of trunk  
upper arms & thighs



Anaesthesia in red



12

Thesis : Leprosy

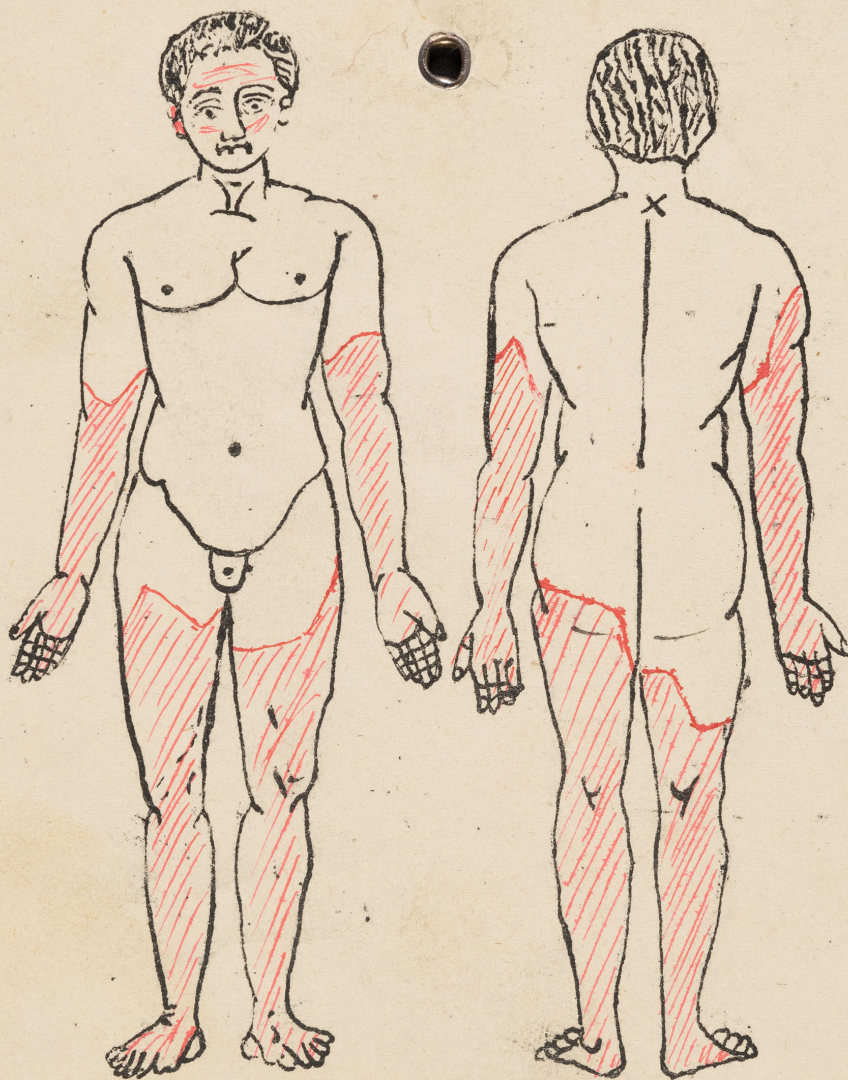
Thurber



ho 133

hanhay

13  $\frac{8}{06}$



Anaesthesia in red

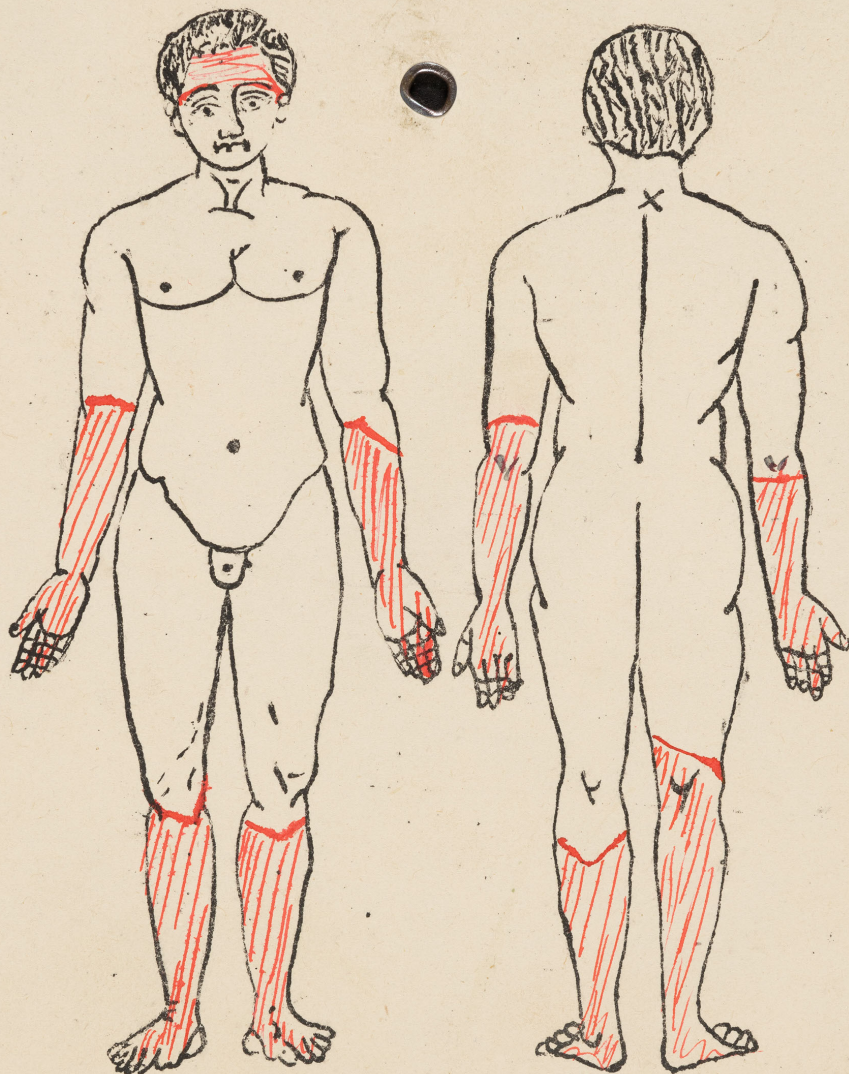


Thesis : Leprosy

Trunkles



Ramallin 10/16/1



Anaesthesia in red



Thesis : Leprosy

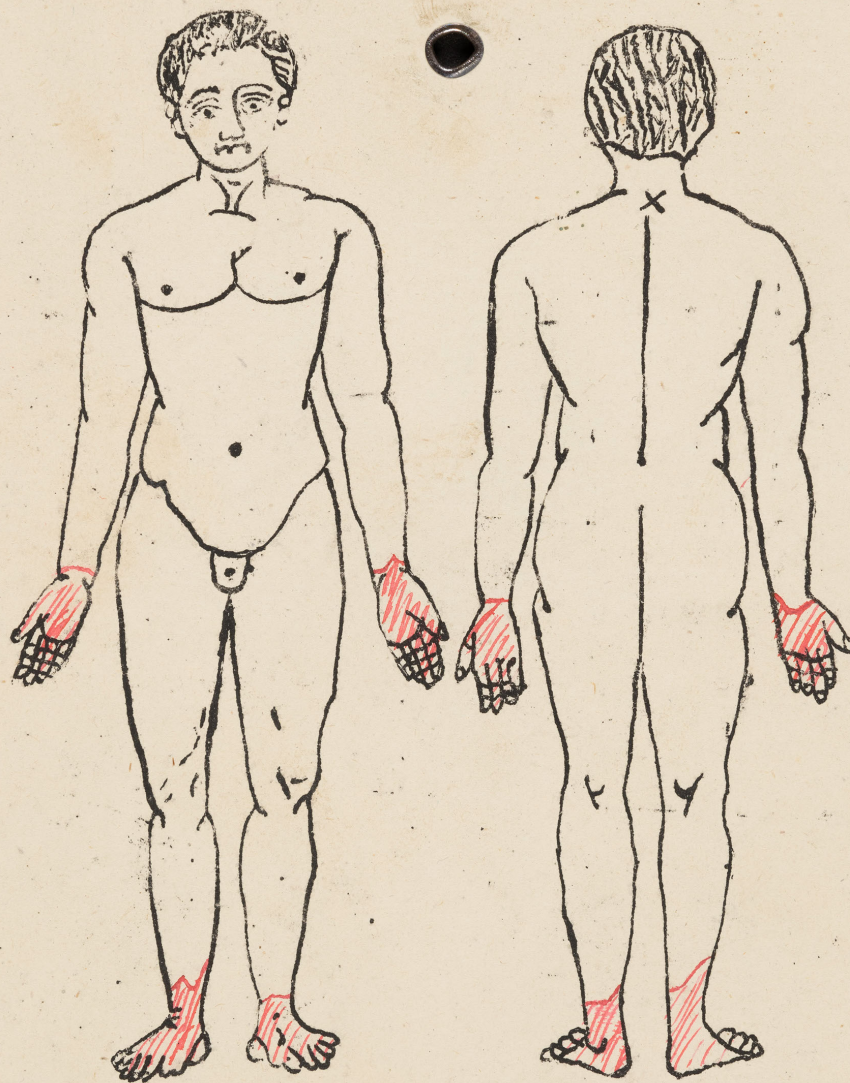
Thurber



no 123

hepal Dass hus

31  $\frac{8}{06}$



also the soles

Anaesthesia in red



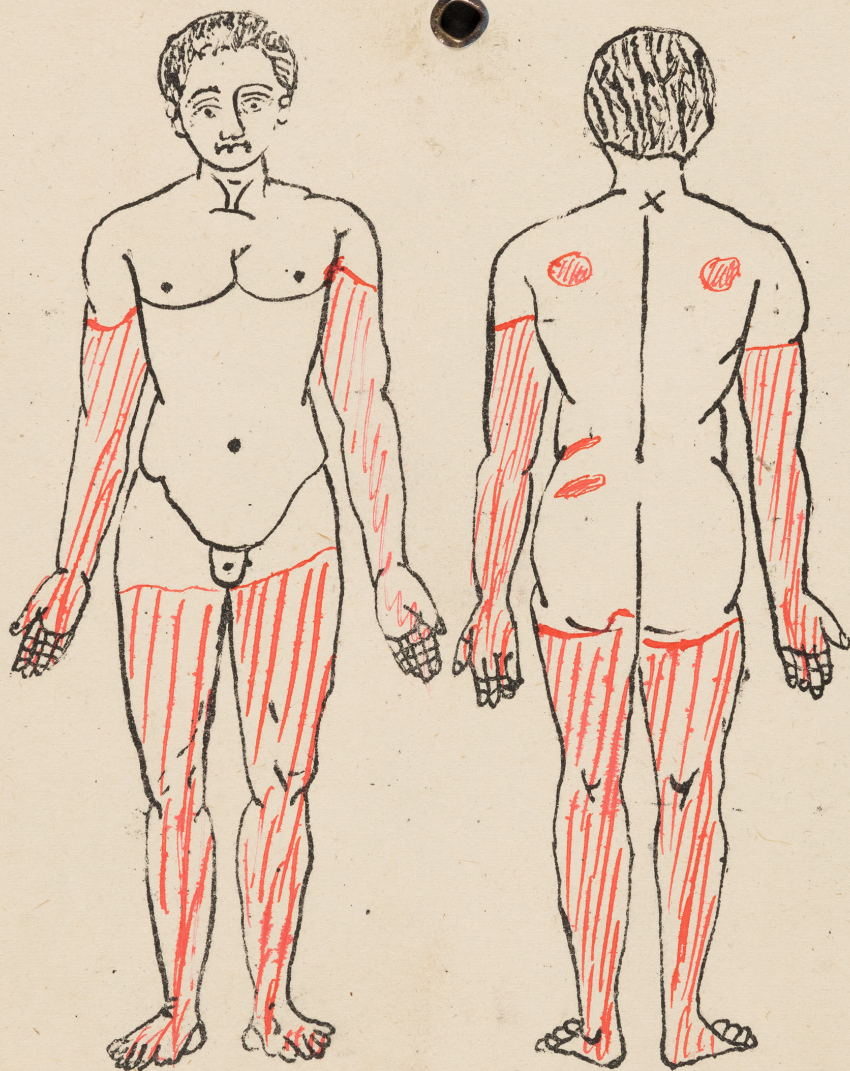
15

Thesis : Leprosy

Thurber



no 129 kishan hal



Anaesthesia in red.

In this case 4 maculae were anaesthetic

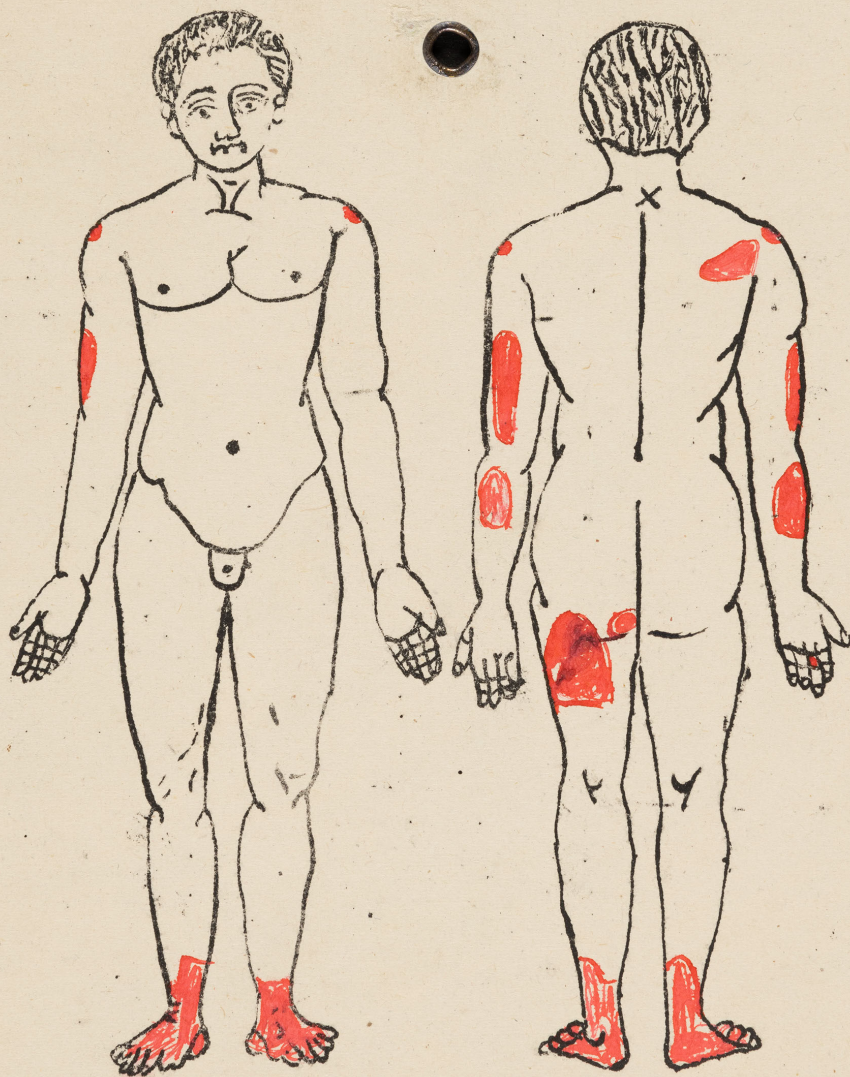


Thesis : Leprosy

Trunk



Hy 127 Raphobar



Anaesthesia in red

Several large maculae anaesthetie



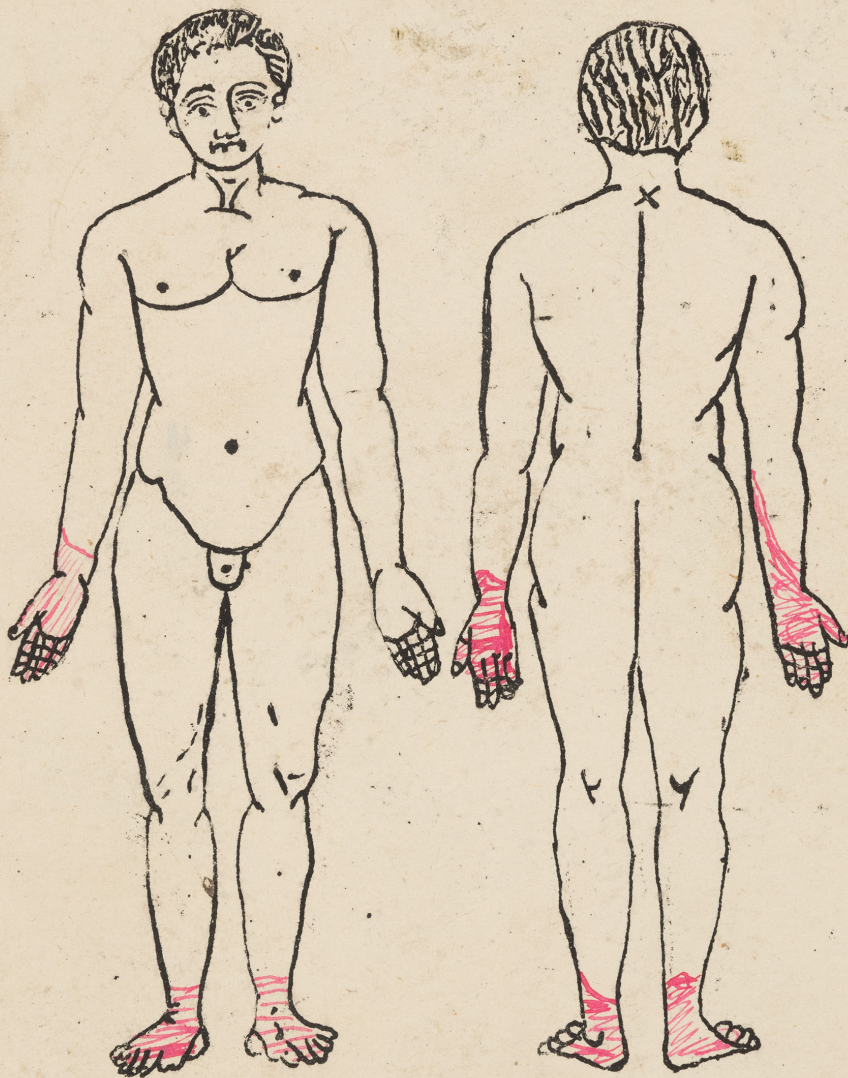
17

thesis : Leprosy

Thurles



Barn doors



Anaesthesia in red

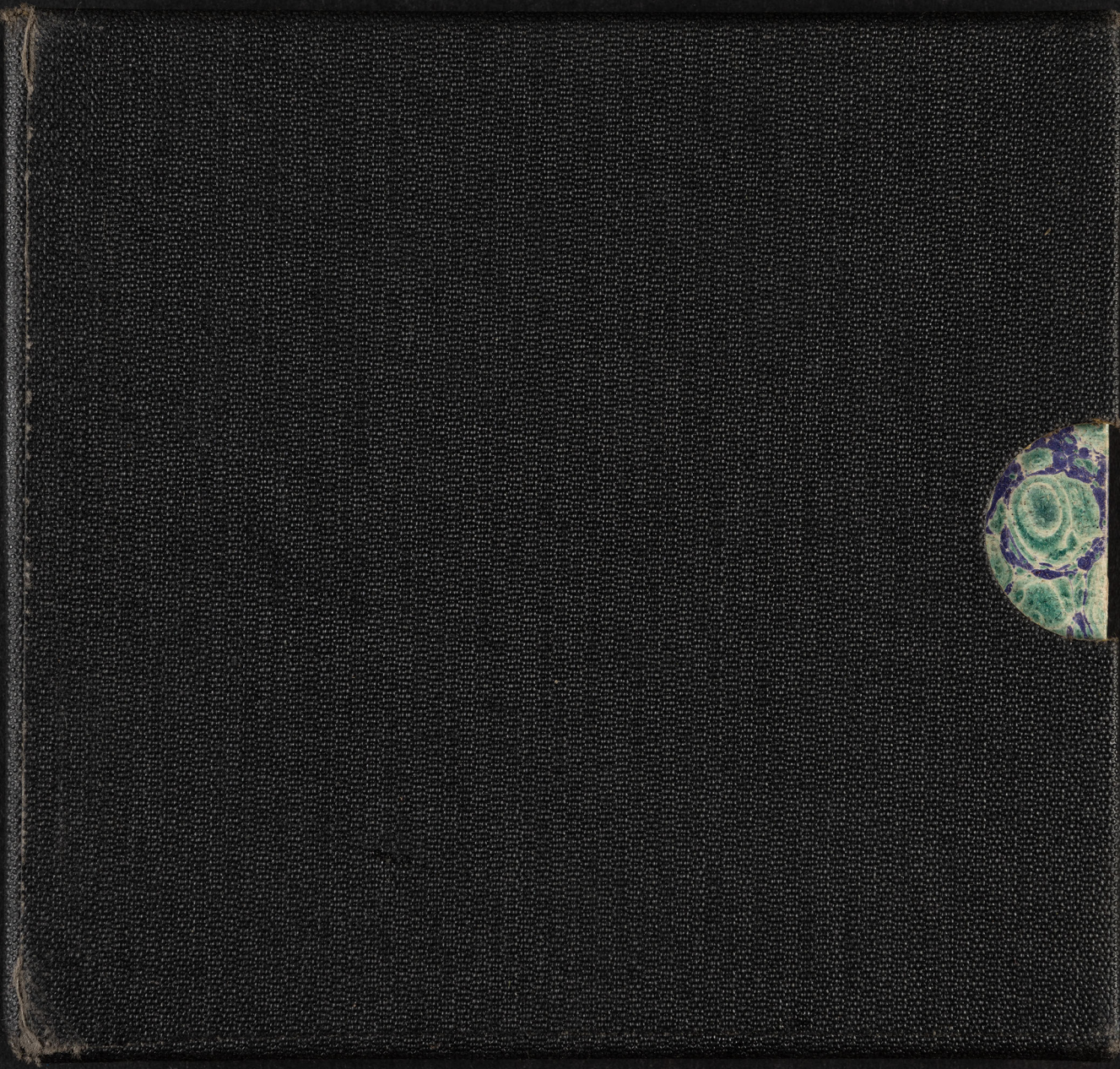


Thesis : Leprosy

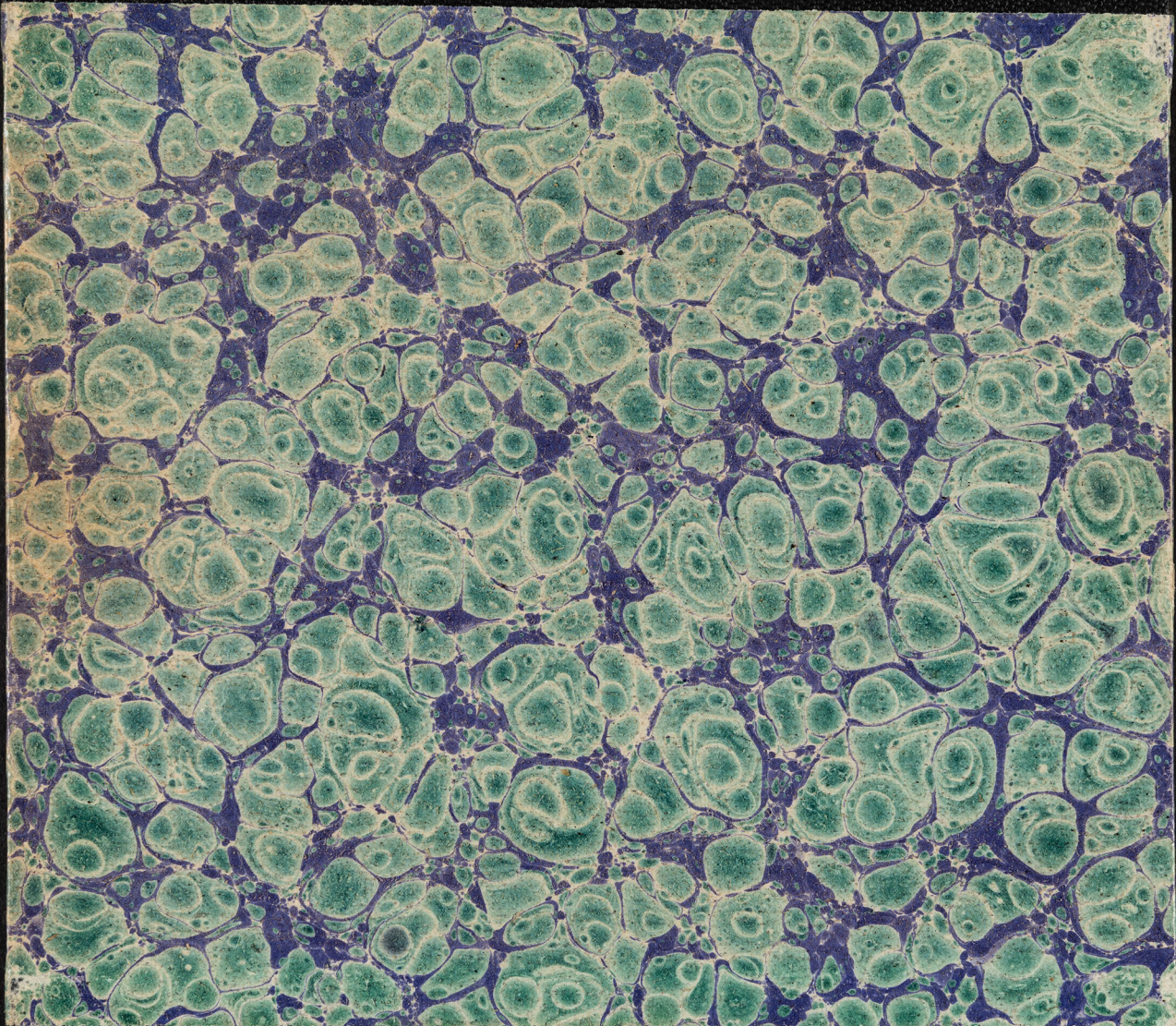
Thurber

capt Thos











1. Lichens on  
 Chamaeneris  
 Sumatra  
 18115



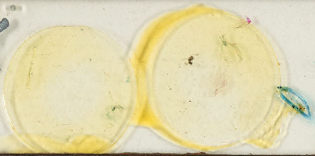
2. Lichens  
 Sumatra



3. Lichens  
 Lichens on  
 Chamaeneris



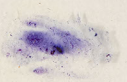
4. Lichens  
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 Chamaeneris  
 Sumatra



5. Lichens  
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 Chamaeneris

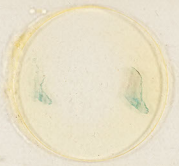


6. Lichens  
 Lichens on  
 Chamaeneris





1. Lenticles on  
Epiphyllum  
Sumner  
Aug 11/5



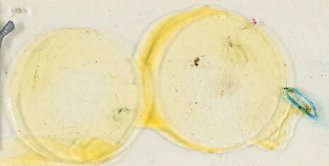
Sumner 2  
Lenticles  
Sumner  
Nov 11/5



3. Section of  
lenticle on  
Epiphyllum  
Sumner  
Nov 11/5



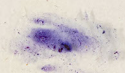
1. Section of  
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Sumner  
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3. Lenticle  
on  
Epiphyllum  
Sumner  
Nov 11/5

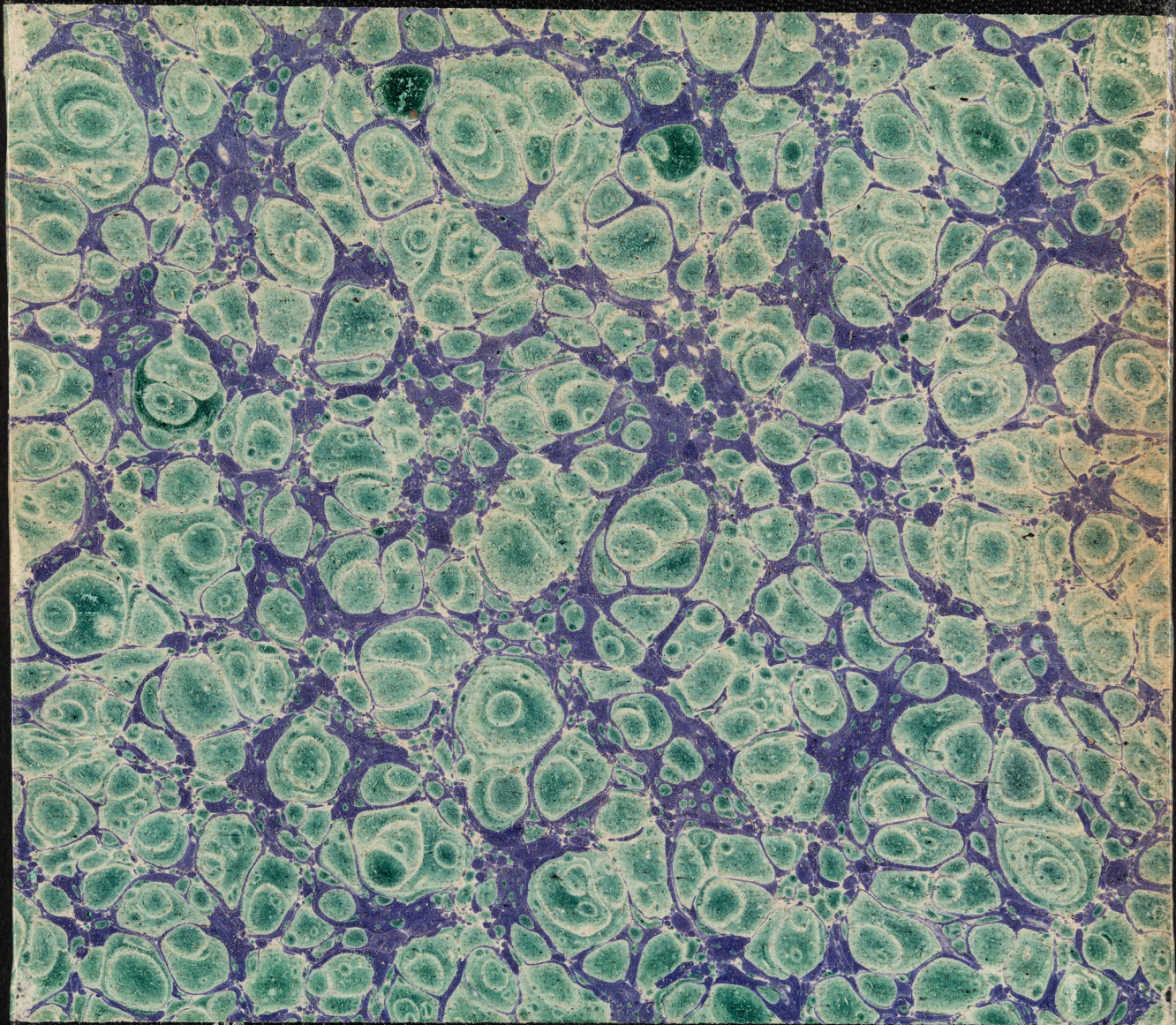


Sumner from  
Epiphyllum  
Sumner  
Nov 11/5

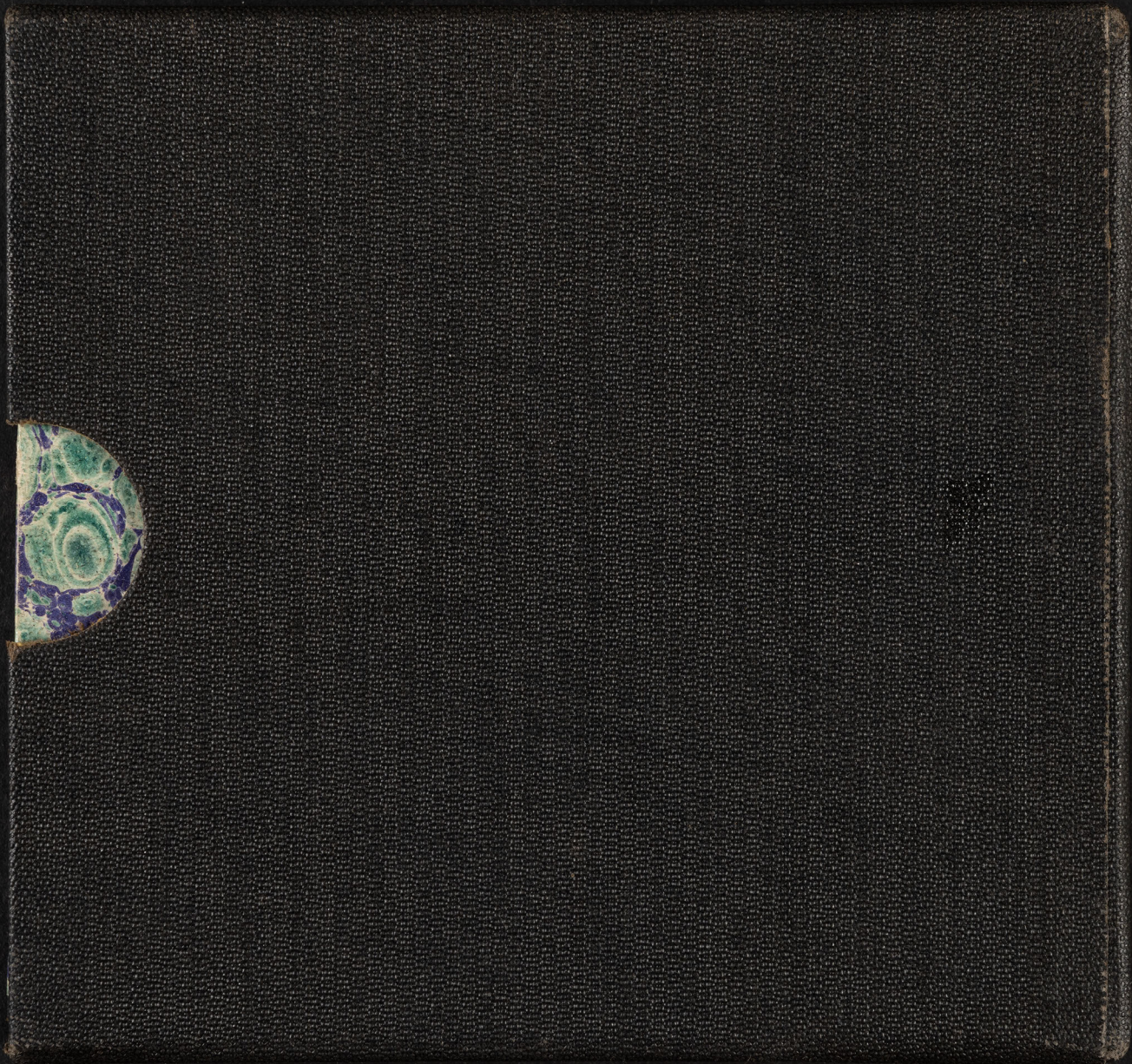


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LEPROSY: Some Notes on its Causation, Symptoms and  
Treatment, based on an Experience of 152  
Lepers in the Leper Jail of the United  
Provinces, India.

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With 18 Diagrams and 6 Microscope Slides.

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T. HUNTER, M.A., B.Sc., M.B.Ch.B.  
Capt:I.M.S.



LEPROSY: Some Notes on its Causation  
Symptoms and Treatment based on an Ex-  
perience of 152 Lepers in the Leper Jail  
of the United Provinces, India.

From the 26th April 1905 to the 24th February 1907,  
in addition to the ordinary duties of a civil surgeon of the  
Indian Medical Service, I held the post of superintendent of  
the Rai Bareli Jail. This jail has a population of about 500  
prisoners and in it is a block for leper prisoners. To this  
block are sent all leper convicts sentenced in the United  
Provinces of Agra and Oudh.

On the day on which I took over charge of the jail  
the leper block contained 64 lepers, and during my term as  
superintendent 88 lepers were admitted. Out of this total of  
152 lepers 24 were for various reasons not examined in detail  
by me personally. On the records of the balance, 128 lepers,  
this thesis is based.

The total number of cases examined with reference  
to certain points, it will be found, is not always the same, as  
in some of the cases remaining <sup>where</sup> ~~when~~ I took over charge com-  
plete notes were not recorded; but the figures given for the  
various enquiries in all cases refer to series of prisoners  
without selection.

#### PART 1. Causation.

The causation of leprosy in spite of the discovery  
of the bacillus leprae, the immediate cause of the symptoms  
of the disease, remains the subject of discussion. The weight  
of opinion is that the disease is contagious and that each new  
case arises by contagion from another case. Opposed to this is  
the/



the opinion so strongly held by Mr Jonathan Hutchinson that leprosy arises from the eating of bad fish. More recent than both of these is the suggestion that the disease is conveyed by the bite of the mosquito and the bed bug.

The third of these explanations of the origin of leprosy will be little more than mentioned. A letter signed by E. S. Goodhue, Government Physician, Hawaii, which appeared in the Lancet of 12th May 1906 p. 1347, claimed that bacilli leprae had been discovered in mosquitoes (*Culex pennis*) and bed bugs (*Cimex lectularius*) by Dr W. J. Goodhue, Medical Superintendent of Molokai Leper settlement, and suggested that those were the spreading agents. Details have not yet been published but that the disease should be, even to any great extent, communicated by mosquitoes or bed bugs seems improbable when one considers the comparatively small number of persons affected in a country like India where mosquitos and bed bugs are practically of universal distribution, and when ~~one~~ <sup>one</sup> contrasts the prevalence of leprosy with that of malaria, a mosquito-spread disease.

That leprosy is caused by fish eating is a proposition that has more of the elements of probability, and when supported by the weighty authority of Mr Jonathan Hutchinson is one which demands careful consideration.

This is no new doctrine in India, for it is a common belief amongst natives of that country that fish food and especially fish eaten with milk may bring on leprosy. The Indian Leprosy Commission of 1890 - 91 considered the question of fish eating as a possible causative factor, and, after examination of several hundred persons affected, the commissioners put on record their opinion that there was "no doubt that the consumption of fish was not the cause of leprosy".<sup>(1)</sup>

Mr/

(1) Report of The Indian Leprosy Commission - p. 844.



Mr Hutchinson was not satisfied with that verdict, however, and having in 1902 - 1903 toured India to investigate at first hand evidence for or against his hypothesis he has stated in his book published on the subject that he "came away with an assured conviction that whilst there is in India very much which gives strong support to the fish hypothesis there is nowhere anything which contraverts it". (1)

Mr Hutchinson is inclined to refuse due weight to the statistics of the Indian Leprosy Commission and to get behind them by saying that many reasons combined to render open to doubt statements made by lepers, about having eaten or not having eaten fish. He points out that the native of India is very apt to answer not according to actual fact but according to fancy or according as he thinks he is wanted to answer; and he thinks the commissioners may have been satisfied with an easy enquiry and that they may have too readily accepted answers given them. The commission report, too, he says does not specify whether fresh fish or salted fish, fresh water fish or sea fish, was enquired about; and he believes that confusion from misunderstandings on these points may have falsified their figures. And finally he states that, since the commission report, the fish hypothesis has embraced "commensal communication" as a possible additional factor in the spread of the disease. In the present enquiry the fish hypothesis has been considered with all these points in mind.

The fish hypothesis as held by Mr Hutchinson briefly stated, is that leprosy is acquired by eating bad fish, but that in some few cases persons who have never eaten fish may have acquired the disease from food contaminated by having been touched/

(1) On Leprosy & Fish eating by Jonathan Hutchinson - p. 122.

Note: (1) On Leprosy & Fish Eating pp. 5, 25 - 26.

(2) - Evidence pp. 25 - 26 & 27.



touched by a leper (commensal communication). Uncured non-salted fish kept till decomposition has set in is not excluded,<sup>(1)</sup> but, according to Mr Hutchinson, badly cured fish is the chief cause of the disease.<sup>(2)</sup>

The evidence for or against uncured fish, cured fish, and contaminated food, as causes of the disease will be taken up separately.

In the enquiry on these points the following method was adopted. On admission to the jail the lepers were examined by me personally. When each man was questioned about having eaten fish it was made clear to him that the enquiry referred to fish of any kind, eaten at any time, and not only to the habitual use of fish as an article of diet. Each man moreover was examined apart from the other prisoners.

The facts thus elicited were recorded in each man's history, and it is worthy of note that a subsequent enquiry, made to check these original entries, detected only one discrepancy. This subsequent enquiry was conducted towards the end of my term as Superintendent and was completed in one afternoon. No previous intimation of it was given to any one, warder or prisoner. Each leper in the jail on that particular day - the total was 63 - was taken apart from the others and questioned on the subject of fish eating with the same care as has been noted above. No one knew beforehand the purpose for which he was taken out of sight and earshot of the other prisoners and, having been questioned, no prisoner was allowed to return or communicate with those waiting for examination. The only man whose second statement did not agree with that made on admission was a Brah man who, on admission, said he might have eaten fish as a child, and at the second enquiry, said he had never eaten fish.

Note. (1) The examination of the prisoners brought out the fact/

Note: (1) On Leprosy & Fish Eating pp. V, 44 - 46.

(2) Ibidem pp. 45 & 49.



fact that fish was extensively used as an article of diet throughout the United Provinces, but that the fish eaten was fresh fish. This is easily procurable at most places from river or tank at some season of the year and apparently is a common article of diet with all castes except Brahmans and Bannias.

Of 128 leper prisoners examined in Rai Bareli jail 34 (or 26.60%) denied having eaten fish at any time. As a means of comparison a series of 128 consecutive prisoners of the ordinary jail i.e. non-lepers, were questioned on the point with the same precautions as had been exercised with the lepers, and of these 35 (or 26.66%) denied ever having eaten fish. The proportions of fish eaters among lepers and non-lepers therefore were practically the same. (1)

With a view to comparing lepers and non lepers as far as fish eating goes another plan was adopted. Amongst Hindus the two castes whose tenets most strictly enjoin vegetarianism are Brahmans and Bannias. Mr Hutchinson would doubt the ~~veracity~~<sup>veracity</sup> of a Brahman or a Bannia who asserted that he had never eaten fish; but there can be no doubt about it that it is distinctly exceptional to find a man of either of those castes who is not a strict vegetarian. If fish eating then is the cause of leprosy, one would expect that the proportion of Brahmans and Bannias amongst lepers would be less than the proportion of those castes amongst the general population; and similarly that the proportion of Brahman and Bannia leper prisoners to the total leper prisoners would be less than the proportion of Brahman and Bannia non leper prisoners to the total non leper prisoners of the ordinary jail.

The/

Note. (1) The Indian Leprosy Commission Report p.342 gives a percentage of 21.3 non fish eaters out of 464 lepers examined. These cases were from all parts of India - seacoast and inland - and this fact alone sufficiently accounts for the higher percentage of non fish eaters found amongst the prisoners, as the United Provinces are entirely inland.



The admissions to the jail for the period 26th April 1905 to the end of November 1906 were scrutinized and it was found that this difference did not exist. In 84 lepers admitted there were 11 Brahmans and Bannias or 13.10% whereas in 1234 non leper admissions Brahmans and Bannias totalled 164 or 13.29%. The difference is nominal.

The figures of 1901 census of the United Provinces give still more convincing evidence of this kind, and a few extracted from p. 206 of the census <sup>report</sup> are here given.

	<u>Lepers per 10,000.</u>	Males.	Females.
General population		3.59	1.08
Brahmans		4.05	1.16
Bannias		3.41	.95
Chamars (a very low caste who eat (anything))		2.89	.93

"The highest caste in the latter (Hindus) viz. the "Brahmans shows a larger proportion than any of the others." (1)

The available evidence then as derived from the above facts is against the hypothesis that leprosy in India is caused by eating uncured fish.

If facts observed in the United Provinces militate against the doctrine that the eating of bad fish not cured or dried is the cause of leprosy, much more so do they militate against the doctrine that eating badly cured fish <sup>is the</sup> cause of the disease. For some time no evidence could be obtained of the use in the United Provinces of anything in the nature of cured or dried fish at all. Prisoners and jail staff, the latter educated Indians, except a few men who had visited Calcutta or Bombay, did not know of such an article of diet. Towards the end of the period of enquiry however it was found that certain prawns/

Note. (1) "Report of 1901 Census of the North West Provinces of India" (now United Provinces). p. 203.



prawns (<sup>shing</sup> jhinga) generally eaten fresh were occasionally sun dried and thus preserved for a few months. For the purpose of this enquiry these dried prawns were taken as cured fish. Even they however are very little used and many persons had never heard of them being preserved by drying. Enquiries were made from many educated natives of all classes and no other article of diet coming into the category of dried or salted fish could be discovered to be used in the United Provinces - excepting of course tinned fish imported for and exclusively used by Europeans.

When the facts about the prawns were learned all the lepers then in the jail - 61 in number - were again carefully questioned and this time direct questions were made about dried prawns. Of the 61 lepers, 48 had never eaten cured prawns, 13 had eaten them at some time or other, most of them very occasionally and as a rule only once or twice in their lives.

In getting at these figures the same precautions were adopted as have been noted above; and moreover of the 48 who had never eaten the dried prawns many readily admitted having eaten fresh fish. The figures are believed to be accurate.

To compare lepers and non lepers on this point 61 consecutive non-leper prisoners of the ordinary jail were similarly questioned, and of these 11 admitted having at some time or other eaten dried prawns while 50 had never tasted them. The difference is on the side of the hypothesis; but in view of the proportion of the lepers who had never eaten the dried crustacean it may be neglected, and it can be confidently asserted that there is no evidence in favour of the idea that the eating of bad preserved prawns is the cause of leprosy.

It might be said that those who had never eaten prawns had acquired the disease by eating bad uncured fish and/



and vice versa. This possibility was examined. Of the 49 lepers who had never eaten cured prawns 13 had also never eaten fish, and all the non fish eaters were also men who had never eaten prawns of any kind fresh or cured.

The general conclusion then from these facts is that in the United Provinces of Agra and Oudh no circumstantial evidence has been discovered supporting the hypothesis that leprosy as met with in that part of India is due to the eating of bad fish, cured or uncured.

To explain cases where fish eating cannot possibly have been the cause the Fish Hypothesis has lately embraced "commensal communication" - communication of the disease from a leper to a healthy person by that person eating food touched by the leper. This which is really a restricted form of contagion will now be considered in view of the histories given by the Rai Bareli lepers.

The proportion of the leper prisoners in which there was no history of fish eating, given above as 26.60%, may be taken as at least approximately accurate. That such a large percentage acquired the disease through eating food contaminated by contact with a leper apparently even Mr Hutchinson would think improbable.<sup>(1)</sup>

The actual number of lepers believed never to have eaten fish was 34 and to 16 of these leper prisoners no other leper was known before admission to the jail. An hypothesis, which declares the disease not contagious but which requires that out of 128 persons affected 16 acquired the disease by eating food in some way contaminated by a leper, though no leper whatever was known to them and though the proportion of population affected is less than 3 per 10,000, can not be said to be well substantiated.

But/



But even more fatal to the idea of commensal communication than those figures is the infrequency of the communication from husband to wife.

In India husbands and wives do not eat together.

In rich well appointed households the wives have their food cooked apart from that of their husbands and eat it apart; but in poorer households the husbands eat first, and after them from the same vessels the wives eat what is left. This latter arrangement holds in by far the majority of cases. Moreover, in India by all classes food is eaten not with spoon, fork or knife, but with the fingers direct.

If then commensal communication is to be accepted as the explanation of how the disease has been acquired in many cases where the contamination of food must have been remote and of the slightest degree, such as cases where no acquaintance with lepers existed, individuals whose food is habitually exposed to such contamination should rarely escape the disease, and communication of the disease from a leprous husband to his healthy wife should be the rule.

The prisoners histories were here useless but the Report of the Indian Leprosy Commission pp 308 - 310 gives some figures directly bearing on the point. The commission examined 381 couples of each of which one member was a leper. All these couples had lived together for at least five years, and in 25 cases only was the disease traced from one member to the other. Of these 25 the commissioners, for reasons not stated, eliminated six leaving the number of communications from husband to wife or vice versa at 19 or 4.9%. Unfortunately the proportion in which the leper member of the couple was the husband is not stated but it may be safely assumed that this was more often the case. The figures make it impossible to accept commensal communication/



communication as the mode of infection in non fish eaters the knowing no other lepers.

The most general present day opinion seems to be that leprosy is contagious.

The histories of the leper prisoners are not full enough to give much evidence for or against the contagiousness of leprosy. Enquiries, however, were regularly made about the existence of leprosy in relatives, associates or acquaintances with the results tabulated below:-

Total No. of Lepers.	Leprosy in Family.	Leprosy in Associates.	Leprosy in Acquaintances.	Knew no other leper out of jail.
136	39	29	14	54

The absolute accuracy of the facts denoted by these figures of course can not be vouched for. It is believed that they are true so far as the prisoners themselves knew; but naturally in a disease like leprosy, which may exist for some time with little or no prominent symptom, the probabilities are that in an endemic centre such as India there are persons who are lepers though this is not known to their friends and probably not even to themselves. Granting then that such cases may exist and admitting for the sake of argument that, as is suggested by Dr L. Sinclair Black in his paper in the Lancet of 28th April 1906 (page 116) these cases may be "sources of infection" the error resulting from their omission is certain to be much smaller than the error in the other direction resulting from the fact that between prisoners on one hand and relatives associates and acquaintances on the other, it was impossible to determine priority of infection.

To return to the figures out of 136 lepers 68 had leper relatives or associates, 14 knew a leper or lepers of other castes, and 54 knew no other leper. At a first glance this/

Note: (1) A man whose brother came home from abroad a leper acquired the disease after having lived with the brother 14 years and, after the brother's death, worn his clothes.



this looks like a strong support of the contagiousness of the disease: the 54 who knew no other leper are apt to be lost sight of in the 68 who had some history of association with lepers. But this 68 really proves little. To support the theory that the disease is contagious what is wanted is the number of persons who have associated with lepers and of these the number who have acquired the disease. Such an enquiry was beyond the scope of this thesis.

The doctrine of the contagionists as enunciated by Prof. Neisser at the International Congress of Dermatology 1904 - {Lancet 19th November 1904 (p 1453)} is that the "disease is contagious and spread exclusively by lepers".

A certain proportion of cases occur in individuals who have associated with other persons affected and extension by contagion might explain these; while cases like the often quoted one reported by Dr Benson in the Dublin Journal of Medical Science for 1877 (1) seem to admit of no other explanation than that the disease spread by contagion to a healthy person from a leper. But the exact mode of diffusion remains undetermined though in all such cases a long and intimate association seems necessary.

A certain other proportion of the cases of leprosy however arise where enquiries fail to trace a preexisting case of the disease from which contagion could have been acquired. Of 136 lepers in Rai Bareli jail 54 it was shown were in this group. If the theory of the contagionists be accepted it must be presumed that such cases of leprosy acquired the disease during some chance unknown and therefore, in most cases at least, slight and fleeting, association with a leper - unlike the long and intimate intercourse which seems to have been necessary in cases where the spread by contagion has been most clearly established/

Note: (1) A man whose brother came home from abroad a leper acquired the disease after having lived with the brother 1½ years and, after the brother's death, worn his clothes.



established. If such a presumption is passed it must be admitted that leprosy, at times at least, is bound to be a very easily communicable malady. But all the known facts of the disease are in conflict with this; and it is inconceivable that a very easily communicable disease, which is very rarely cured, to restrict which practically no measures of segregation are practised, and of the sufferers from which very few have recourse to treatment, should show as does leprosy a steady decrease amongst the general population.<sup>(1)</sup> Again occasional cases of leprosy reach Britain from countries where the disease is comparatively common but no danger is apprehended that these cases will act as foci for the extension of the disease in this country. Leprosy can not be looked on as at all easily communicable and cases like the 54 above still await explanation.

One more point in this connection is of the number of persons in intimate association with lepers the small proportion which actually acquires the disease. The Indian Leprosy Commission<sup>(2)</sup> investigated 104 cases of individuals who had long associated with lepers and of these only one, or possibly two, had acquired the disease. The records of the Rai Bareli jail give similar evidence. No warder in the institution has become infected. A dresser has worked amongst the lepers for 9 years dressing sores daily, and although till recently he exercised no special precautions this man has not contracted the/

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Note: (1) Census Year.	Leper Totals.	Number per 10,000	
		Males.	Females.
1881	17822	6.30	1.59
1891	16895	5.74	1.30
1901	11328	3.59	1.08

Census Report of United Provinces for 1901

Note: (2) Indian Leprosy Commission report p. 321.



the disease. And several cases are on record of prisoners admitted to the leper jail as doubtful lepers or under wrong diagnosis who remained in the leper block for long periods and who finally were transferred without having acquired the disease. Three of these cases, who had been in the leper jail  $4\frac{1}{2}$  years,  $3\frac{1}{2}$  years, and 2 years, respectively, were personally transferred by me. These facts do not negative contagion as a factor in the spread of the disease but they indicate that, if the disease is a contagious one, in addition to the actual contagion itself other conditions of not less importance are requisite before the contagion can act. What these conditions are remain undetermined.

In the present state of our knowledge comparison with tuberculosis seems to provide the clearest conception of the method of diffusion of leprosy. In both diseases there seem to be well established examples of extension by direct contagion, in both in addition to the actual presence of the contagium vivum other conditions seem requisite before the disease can develop, and in both a certain number of cases arise so completely independently of other cases that the only satisfactory explanation which presents itself is a more or less general distribution of the respective bacilli (of the bacillus leprae probably only in endemic areas) which remain capable, given the necessary conditions, of giving rise to the disease. For markedly, however, from Hansen's figures for Norway

which work out at practically equal incidence in all parts of the country.

M.A. - nodular and nodular & mixed.

52 - 53 - 54 - 55 - 56 - 57 - 58 - 59 - 60 - 61 - 62 - 63 - 64 - 65 - 66 - 67 - 68 - 69 - 70 - 71 - 72 - 73 - 74 - 75 - 76 - 77 - 78 - 79 - 80 - 81 - 82 - 83 - 84 - 85 - 86 - 87 - 88 - 89 - 90 - 91 - 92 - 93 - 94 - 95 - 96 - 97 - 98 - 99 - 100

No/

Note: (1) Indian Leprosy Commission Report p. XV.

(2) Vide "Leprosy" by G. H. H. M.D. page 115.

(3) Hansen & Croft transl. by N. Hansen.



Part II SYMPTOMS.

Two distinct forms of the disease have been recognised, the maculo-anaesthetic and the nodular, and well marked cases of these offer a striking contrast in appearance.

But many lepers present the symptoms of both of these cardinal types and therefore a grouping into three classes, maculo-anaesthetic, nodular, and mixed, has been made. This is the usual classification. Hansen, however, adopts two groups only, including in the nodular all mixed cases.

The maculo-anaesthetic type is the less acute form of the disease; and a noteworthy feature of the cases in Rai Bareli jail was the comparatively large number of the maculo-anaesthetic type. In 149 lepers there were 85 of this class, 11 nodular, and 53 mixed, equivalent to a percentage proportion of

Maculo-Anaesth.	Nodular	Mixed.
57.05	7.38	35.57

These proportions are very similar to those given by the Indian Leprosy Commission for India<sup>(1)</sup> namely

M.A.	Nod.	Mixed
56.6	12.2	31

and they approximate to the percentage given by Hillis<sup>(2)</sup> for 188 cases in British Guiana, viz.

M.A.	Nod.	Mixed.
54.80	18.08	27.12

They differ markedly, however, from Hansen's figures for Norway which work out at practically

M.A.	Nodular & Mixed.
32	68

No/

(3)

Note: (1) Indian Leprosy Commission Report p. XV.

(2) Vide "Leprosy" by G. <sup>Shin</sup> ~~Thur~~ M.D. page 115.

(3) Hansen & Hoelt transl. by N. Walker p 144 Table III



No explanation is vouched for this difference.

In Norway itself Hansen notes that dry inland regions show a greater number of maculo-anaesthetic cases than do moist sea-coast districts. (1) The United Provinces of India is a very dry inland country.

The great majority of cases in the jail were mild, and visitors to the leper block were invariably surprised at the appearance of well-being of the lepers. Of those admitted after 25th April 1905, only five were recorded as "bad cases", and a frequently recurring note in the records was "seems a man in good health but for maculae".

Hansen gives it as his opinion that "the natural termination of every case of nodular leprosy is to pass into the anaesthetic form if only, as occasionally happens, the patient live long enough". (2) The period during which the leper prisoners remained under observation was, for the purpose of noting the development of such a chronic disease as leprosy, very short; but with that proviso it falls to be recorded that while no case of nodular leprosy was noted to have passed into the maculo-anaesthetic form two cases were observed which, maculo-anaesthetic when first seen, developed nodules during the period they remained under observation. The records of the leper jail show frequent examples of this but no instance of the opposite change.

Further evidence of this development of maculo-anaesthetic into nodular or mixed leprosy seems to be presented by the not uncommon condition found in mixed cases - nodular infiltration slight and described by the sufferers as recent together with contractures and deformities of limbs manifesting a maculo-anaesthetic infection of long standing.

In/ hands, thighs and upper arms. In one case the sole of one foot was distinctly affected. The distribution was

(1) Leprosy by Hansen & Looft translated by N. Walker p. 244. 80

(2) Ibidem p 3.



frequently. In no case could a history of prodromal symptoms be elicited. However, to get from a native of India a history of the onset of the most acute disease is often a matter of the greatest difficulty, and little stress therefore can be put on the absence of prodromal symptoms in the history of a chronic disease like leprosy. (nodular and 7 mixed) and generally

marked. The usual type of maculae in those cases which presented this symptom was a patch of pale skin, not raised, more or less irregular in outline, and as a rule with a distinct margin passing directly without inflamed or hyperpigmented border into normal skin. Out of 83 cases admitted about whom detailed notes were made 38 presented maculae of this sort. In a few cases (5) the maculae were of this pale kind but with a slightly reddened or inflamed margin, though there was no complaint of pain; and in a few others (4) the pale maculae had a hyperpigmented border. Two had a slightly raised scaly margin. Enlargement of lymphatic glands, almost always of

the lower. Hyperpigmented maculae were noted in 11 cases: in 7 of these 11 the ordinary pale maculae were also present. One of the 11 had a hyperpigmented patch with a pale border.

Four persons were admitted with maculae described as rough, slightly raised and scaly; and three others with mixed leprosy presented red raised affected areas on the skin which were probably not maculae but large flat nodules. (non or

contracta. The size of the maculae varied from that of a pea to tracks many square inches in extent; and the number, from one or two patches to an affection so abundant that more skin was unhealthy than healthy. A few cases were seen where the skin might have been described as mottled. (not well defined pale

maculae. The parts of the body most affected were back, chest, abdomen, buttocks, thighs and upper arms. In one case the sole of one foot was distinctly affected. The distribution was frequently/



frequently roughly symmetrical. It did not correspond at all with nerve distribution.

In only two maculo-anaesthetic lepers was erythema noted, affecting in one the palm of one hand and in the other the abdominal wall and palms. Erythema was more often seen in nodular or mixed cases (1 nodular and 7 mixed) and generally marked a fairly acute infection.

A thin glossy atrophic condition of the skin, generally of the extremities or back, was observed in 20 of the cases admitted, 6 of whom were maculo-anaesthetic, 12 mixed, and 2 nodular. A dry scaly condition of the skin was less often noted - 11 cases all maculo anaesthetic or mixed.

Swelling of the ulnar or peroneal nerves was noted as present in 13 of the cases admitted; but more frequently - in 18 - it was recorded that the nerves could not be found to be enlarged. Some of the swollen nerves were tender.

Enlargement of lymphatic glands, almost always of the lower inguinal set was noted in 19 cases. Almost as often - in 16 cases - it was noted that the glands did not seem to be enlarged.

Atrophy of muscles (of palms most frequently and next of soles and then of limbs generally) was one of the most common features of the disease (40 cases admitted): and almost as frequent were deformities of limbs from mutilation or contracture (34 admitted).

Bullae were often seen, all in well developed cases. They could often be accounted for by burns.

Disturbance of perspiration was noted unequivocally only in one case. The man had distinct well defined pale maculae all over his chest and these at the time of examination (during the rainy season) were absolutely dry, markedly contrasting with the healthy skin which was beaded with perspiration.

The/



(A)

The distribution of the anaesthesia found in the Rai Bareli lepers was not what was expected from a study of text books. In a few cases some of the maculae were anaesthetic; but maculae which were anaesthetic or hyperaesthetic were the exception and the maculo anaesthetic lepers examined conformed, with few exceptions, to one type in which anaesthesia had no relation to the maculae, seldom occurred in patches, and was as a rule confined to the distal parts of the extremities. A few charts are attached showing this distribution of the anaesthesia and in some depicting also the maculae and bringing into view the independence of maculae and anaesthesia.

Special attention was paid to the sensory condition of the maculae. It has been said above that the usual type of macula was the pale patch of skin. At first it was thought that these pale patches were old maculae and that earlier in their history they had been red or pigmented or scaly. No confirmation of this however could be obtained from the patients themselves. Once or twice pale maculae were noted to have increased in size during the prisoners residence in jail showing that some at least were recent; and finally when the distribution of anaesthesia came to be considered it was clear that the maculae of the Indian leper differed from maculae as described by Hansen, according to whom "pigmentation of the periphery and pallor of the centre indicate that the patch is already old and the pallid centre is always anaesthetic".<sup>(1)</sup>

The common opinion is that the anaesthesia of the maculae, when it occurs, is due to the local action of the bacilli or their toxins <sup>on</sup> ~~in~~ the nerve terminations or fibrils, while that of the distal parts of the extremities is due to changes in the nerve trunks. Looking at the charts attached one finds it difficult to understand this: were the nerve trunks the seat of the mischief in this latter case, one would expect/

Note (1): Hansen & Looft, translated by Walker p. 55.

(A) By "anaesthesia" is meant "loss of sensibility to light touch" felt by cotton wool (vide Macnus Wilson Lectures by Shaver Lancet March 17<sup>th</sup> 1906 et seq)



expect the anaesthesia to be more irregularly outlined, to extend up the limb to different extents in the areas supplied by different sensory nerves, and not to terminate in the regular way it does often in an almost circular line round the limb. The distribution of the anaesthesia of the limbs seen in the Rai Bareli cases is more easily understood on the supposition that the nerve terminations or terminal fibrils in the limbs as in the maculae are the parts of the nervous system affected.

The symptoms peculiar to nodular leprosy varied little from those given in the text books. It is worthy of note, however, that in addition to the sites usually affected as described therein, nodules were found in two cases on the glans penis, once on the palm and once on the sole. All these were confirmed by examination of smears made on the spot and of sections of the nodules ~~was~~ removed by me and cut and stained for me at the Bombay Research Laboratory, specimens of which are submitted with this paper. These three sites Hansen has not seen affected.

In two cases unequivocal massive lepromata were found, <sup>12</sup> ~~the~~ infiltrations in plaques instead of in discrete nodules. The parts affected were in one case the hips, lower limbs and scrotum, in the other one upper arm and the back of both elbows.

The nose eyes and mouth were examined in a routine way in all lepers. In the nose, ulcers were found in 18 cases, only one of which was a maculo-anaesthetic leper. Smears from these ulcers showed leprosy bacilli in 11 cases, one of which was the maculo-anaesthetic.

In the mouth in three cases nodules were found on the hard palate and in one case on the soft palate. Two prisoners were found with ulcers of the palate of leprous origin.

In/



Part III Treatment In only one leper was the disease found affecting the eye. A nodule formed in the lower quadrant of one cornea, penetrated to the iris, and set up iritis. The prisoner was released at this stage. Fresh air, and appropriate light labour were Five prisoners were noted to have affection of the larynx. little surgical measure deemed necessary was done.

Only one example occurred in the jail of nodules breaking down and ulcerating. This man's face and body, while this process was going on, resembled those of a person suffering from small pox. He was released after the condition had passed its worst and with good general health. that none of these

were followed In no case were attacks of fever accompanied by the development of fresh nodules or macules detected. for a simple symptomatic No case of albuminuria was found though the urine was tested in a large number of cases. as injections of 30% emulsions of iodoform in olive oil, by which a German colonial officer, Dr Dissing, was reported to have had success. Injections of 4 c.c. of the emulsion were practised on six selected cases. After 12 injections the practice was suspended to await results. No influence on the disease was detected up to the end of February 1907.

During the period of observation 9 lepers died and 94 were released - 22 with the symptoms alleviated, 21 with the symptoms more pronounced and 51 practically in the same condition as on admission. In two of these which improved no symptoms could be found of the disease at all at release.

In the majority of the cases it was recorded that the general health had improved during the stay in jail, this being not infrequently noted even in cases in which the special symptoms of leprosy seemed to have increased. Of the 94 released 68 had gained in weight (av. gain 9.46 lbs.) 20 had lost weight (av. loss 6.43 lbs.) and 6 showed no change. The average/



### Part III Treatment.

In the jail all lepers were brought under excellent hygienic conditions. Good food, suitable clothing, enforced cleanliness, abundance of fresh air, and appropriate light labour were the lot of all. Sores and ulcers were kept clean, and any little surgical measure deemed necessary was done.

In addition to these general measures medicinal treatment of some kind was practised with most of the prisoners. The medicines tried were chalmogra oil, gurjun oil, salol, and salicylic acid ointment, each in selected groups and over many months. The conclusion come to was that none of these were followed by any special benefit, and towards the end of the period of observation their use was abandoned for a simple symptomatic line of treatment. In December 1906 and January 1907 a trial was made of subcutaneous injections of 30% emulsions of iodoform in olive oil, by which a German colonial officer, Dr Diesing, was reported to have had success. Injections of 4 c.c. of the emulsion were practised on six selected cases. After 12 injections the practice was suspended to await results. No influence on the disease was detected up to the end of February 1907.

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average duration of confinement of the 94 was 12.41 months.

Of the 9 cases who died only one was a maculo-anaesthetic leper. He was stated to have had the disease for 16½ years and had been in the leper jail for 13½ years. The others were mixed cases.

The cause of death in all was some intercurrent affection - diarrhoea in 6, tubercle of lungs in 2, and gangrene in 1. In all the leprosy was of many years duration<sup>(1)</sup> and the prison was markedly debilitated by it.

Post mortem examination revealed nothing specially noteworthy: lepritic affection of the liver was found 4 times, of the spleen twice.

*Thurber*

*Thomas Hunter*

*MA BSc MB ChB*

*Capt JMS*

Note: (1) Duration of disease not known in one case. Average duration of remaining 8 cases was 10.94 years.



## Enclosures

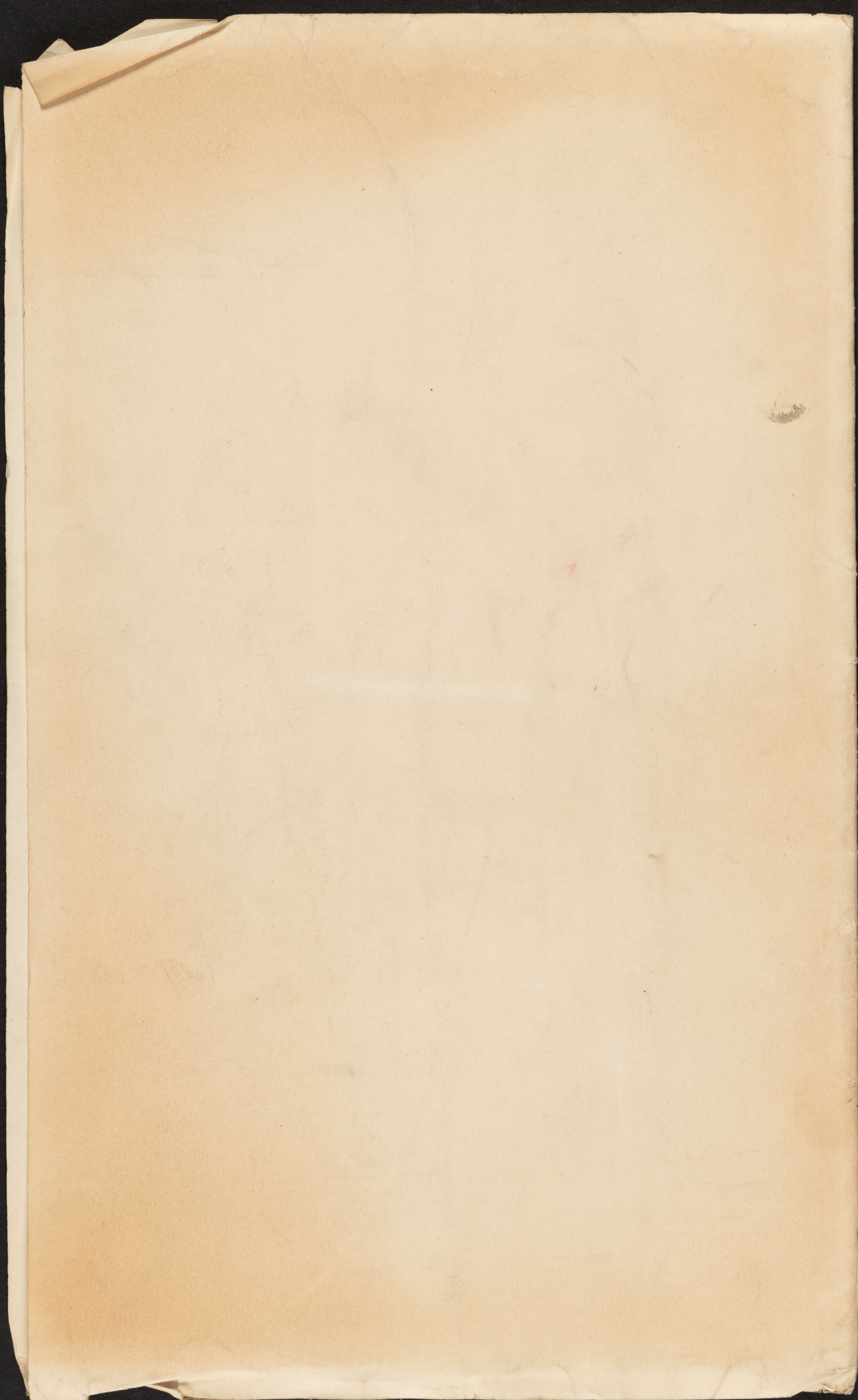
- (i) Eighteen diagrams on cardboard
- (ii) Six microscope slides "

Thanks

### (1) Notes on Slides

- nos 1 & 2 Smear from r section of nodule on glans penis of Sumna. Smear shows bacilli well. Nodule is faintly stained. Bacilli seen. (Carbol Fuchsin & Methyl. Blue)
- no 3 Section of nodule on glans penis of Pokka. (Carbol Fuchsin & Methyl Blue)
- no 4 Section of nodule on palm. One piece shows the epidermis. massive infection. Badly stained but a few individual bacilli visible. (Carb. Fuchs. & Methyl Blue)
- no 5 Section of nodule on sole. Section badly cut & indifferently stained. no epidermis. massive infection (Carbol Fuchsin & Methyl Blue)
- no 6 Smear from missed nodule on palm of Suraj Mull (Carbol Fuchsin & Methyl Blue)







thesis for h. d

"Reproy etc --"

Thunter  
Capt M. S.