Leprosy in British Guiana : an account of West Indian leprosy / by John D. Hillis ; illustrated with twenty lithographic plates, coloured and plain, from original drawings and photographs of patients at the asylum, and several engravings from camera-lucida drawings, by E. Noble Smith, of pathological specimens, mounted and prepared, and explanatory remarks, by P.S. Abraham.

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LEPROSY

IN

BRITISH GUIANA.

AN ACCOUNT OF WEST INDIAN LEPROSY.

BY

JOHN D. HILLIS, F.R.C.S., M.R.I.A.

MEMBER OF THE KING AND QUEEN'S COLLEGE OF PHYSICIANS,
MEDICAL SUPERINTENDENT OF THE GENERAL LEPER ASYLUM, BRITISH GUIANA, WEST INDIES.

Illustrated with Twenty Lithographic Plates, Coloured and Plain,
from Original Drawings and Photographs of Patients at the Asylum,
and several Engravings from Camera-lucida Drawings, by E. Noble Smith, F.R.C.S.,
of Pathological Specimens, Mounted and Prepared,
with Explanatory Remarks, by P. S. Abraham, M.A., B.Sc., F.R.C.S , Curator,
Royal College of Surgeons' Museum, Ireland.

LONDON:
J. & A. CHURCHILL, NEW BURLINGTON STREET.
1881.

Dedication.

TO HIS EXCELLENCY THE GOVERNOR,

C. H. KORTRIGHT, Esq., C.M.G.

AND THE HONOURABLE

THE MEMBERS OF THE COMBINED COURT OF BRITISH GUIANA,

Whose liberality with reference to the Leprous Poor of the Colony has enabled the Medical Superintendent of the Leper Asylum to place them in a position of comparative comfort, and whose liberal Grant in Aid has enabled the writer to pursue investigation otherwise impracticable,

THIS WORK IS RESPECTFULLY INSCRIBED

BY THEIR OBEDIENT SERVANT

THE AUTHOR.

PREFACE.

THIS work is principally intended for the use of practitioners in the West Indies. When first appointed to the charge of the Guiana Asylum, I was at a loss to find a systematic treatise on the disease of leprosy to which I could refer. Carter's large work was out of print, and a copy was obtained with difficulty ; the other standard works have the disadvantage of being written in foreign languages, and the various important papers on the subject were not accessible to one so far removed from colleges and libraries. I therefore thought the information derived from a study of numerous cases of leprosy might not be without interest to those similarly circumstanced, as well as to the profession generally. I am conscious of the numerous defects, but it may be some excuse that it was written amid the hurry of a large general practice, and in a depressing tropical climate. I can, however, claim to have given, to the best of my ability, a faithful clinical description of the disease as it prevails in the important colony of British Guiana.

I regret the pathological part is not more replete with interesting information, but *post-mortem* examinations were made with difficulty, and frequently by stealth, the natives having a horror of their dead being disturbed ; and no accommodation was provided at the Asylum for pathological researches. From want of a qualified local artist, I am unable to bring forward the results of my early microscopical work, for I agree with Dr. Lionel Beale that descriptions, without the plates, are of little use in this particular. I carefully prepared numerous specimens, obtained from autopsies and the living subject, which I brought over in various preservative

media, with the purpose of availing myself of better histological skill at home for their elucidation; and I was glad to get the Museum of the Royal College of Surgeons wherein to work them up, and to secure the services of the Curator in the further microscopical examination of leprous tissue, whose descriptions are embodied in the section on Morbid Anatomy. To Mr. Abraham I am indebted for several valuable suggestions. My thanks are also due to the Hon. W. A. G. Young, C.M.G., Lieut.-Governor, and Staff of the Colonial Office, Demerara, for access to official documents; to Dr. E. A. Manget, Surgeon-General, for much kind advice; to Mr. G. H. Hawtayne, C.M.Z.S., for assistance in mounting specimens, &c.; Dr. J. W. Moore, Fitzwilliam Square, Dublin, for the loan of copies of the *Nordist Med. Arkiv*, and help in translating same; to Mr. E. Noble Smith for the trouble he took with the drawings; and to Messrs. Forster & Co., lithographers, Dublin, and Messrs. J. & A. Churchill, the publishers, for the manner in which they have performed their respective tasks.

DUBLIN, *September*, 1881.

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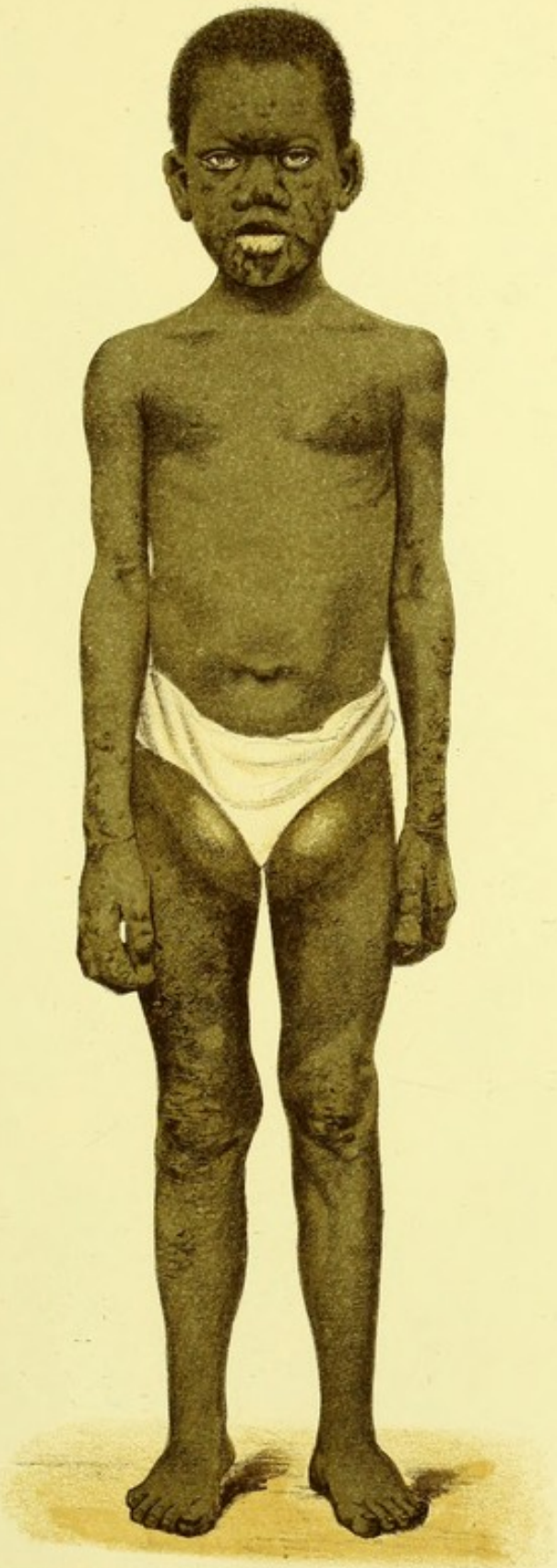

TUBERCULATED LEPRA IN THE NEGRO.—*From a Photograph.*

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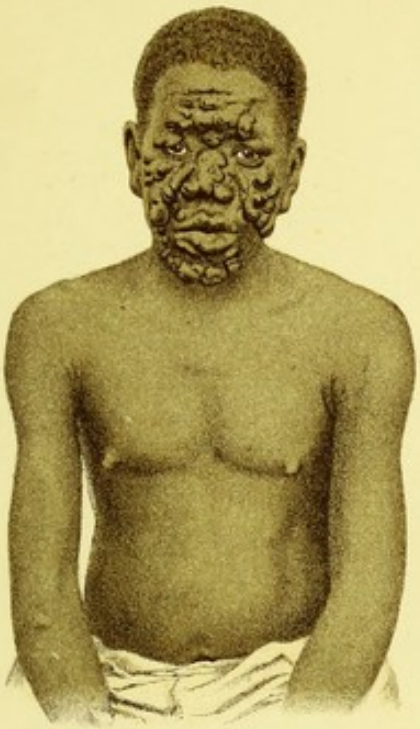
Drawn and Chromo-Lith by Forster & Co., Dublin.

II.



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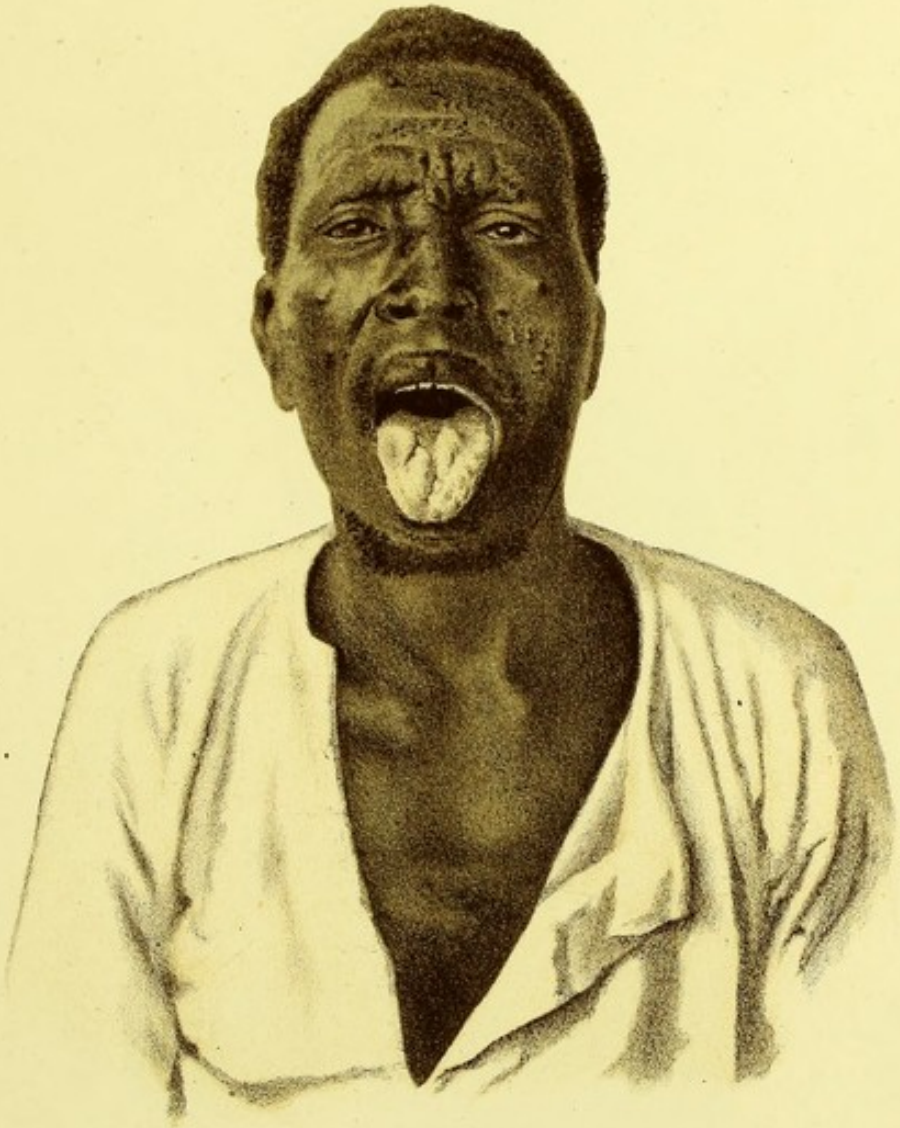
TUBERCULATED LEPRA.—*From Photographs.*

Drawn and Chromo-Lith by Forster & Co., Dublin.

III.



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Drawn and Chromo-Lith by Forster & Co., Dublin.

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Ad nat. del 1879.

Drawn and Chromo-Lith by Forster & Co., Dublin.

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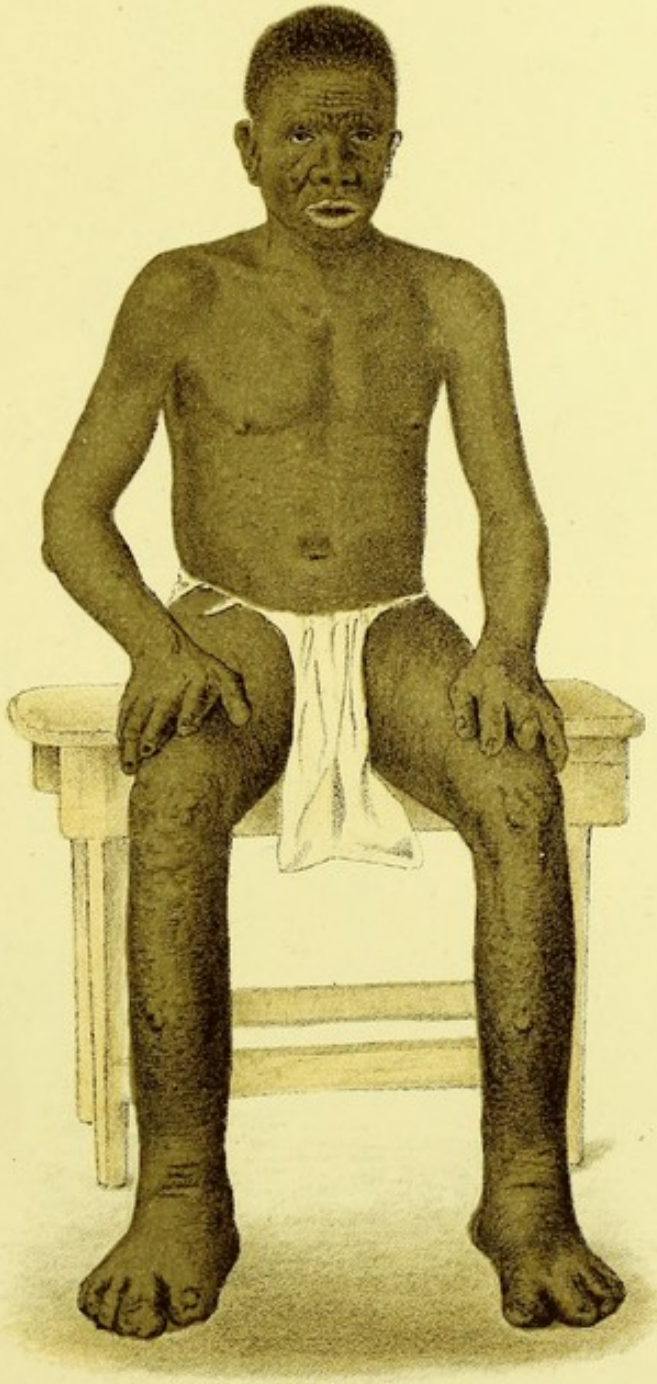

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Drawn and Chromo-Lith by Forster & Co., Dublin.

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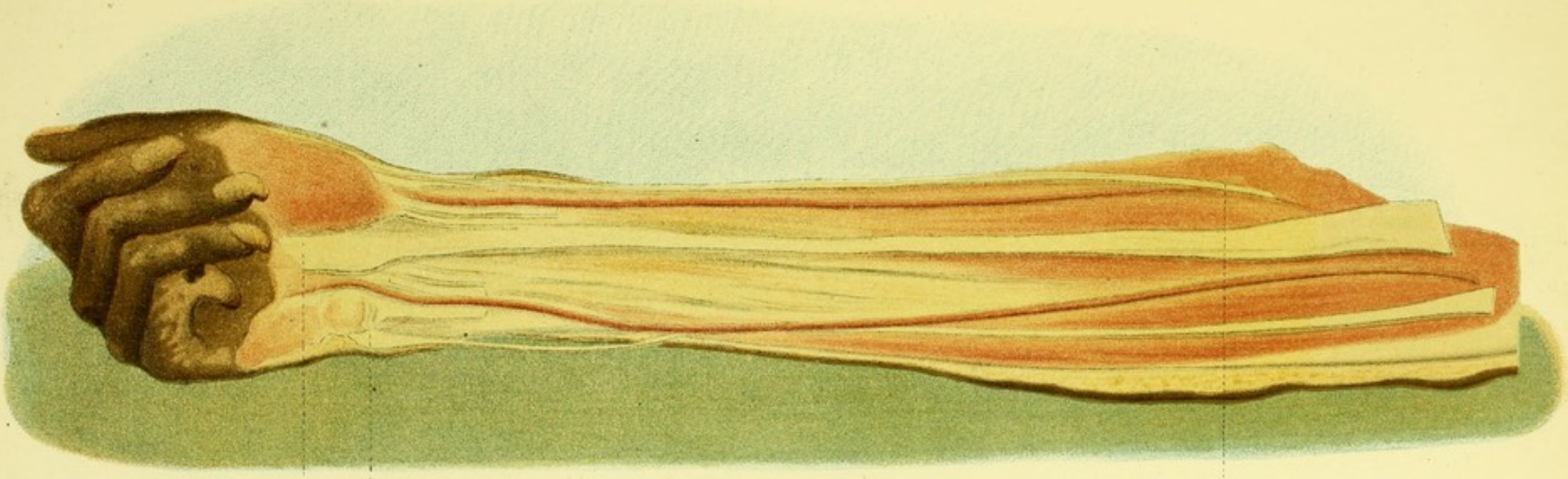
Ad nat. del. 1880.



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Drawn and Chromo-Lith by Forster & Co., Dublin.

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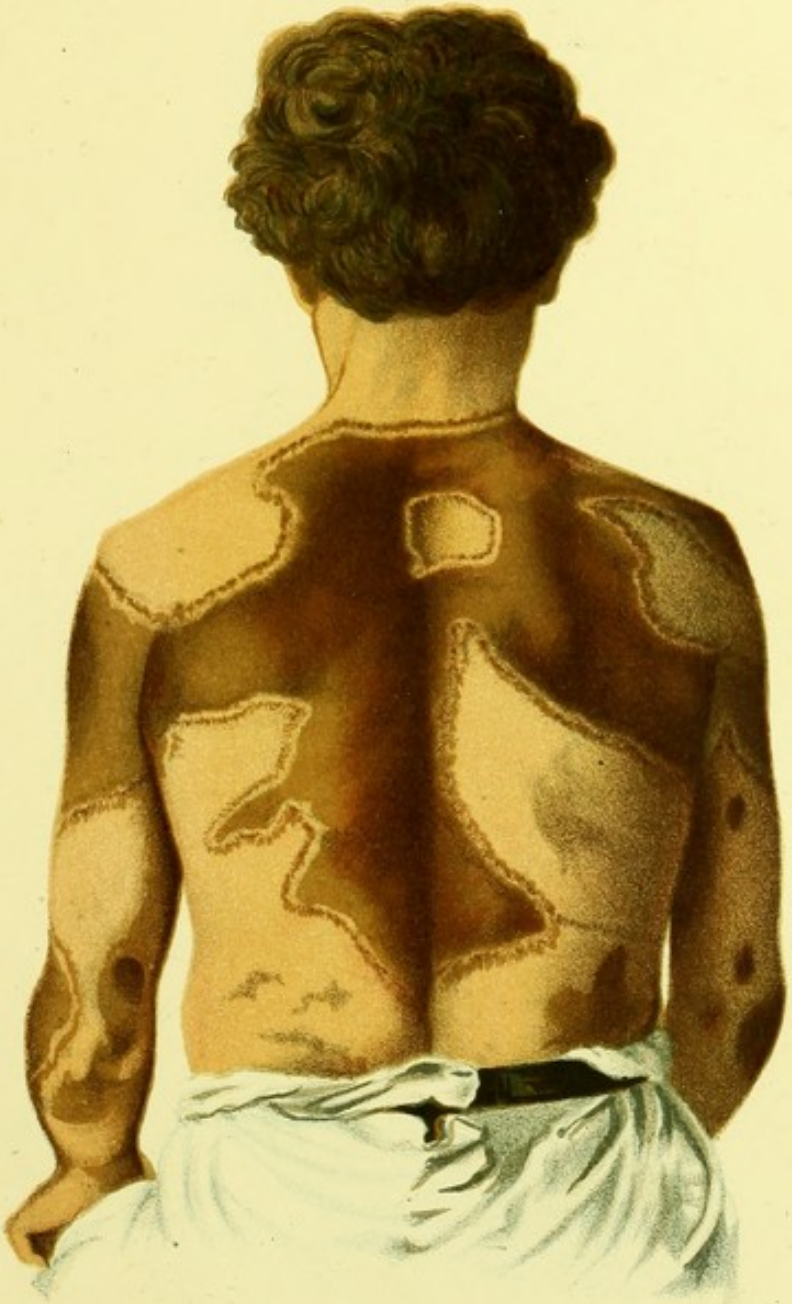
Ad nat. del. 1881.

Drawn and Chromo-Lith by Forster & Co., Dublin.



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Ad nat. del. 1880.

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Ad nat. del. 1880.

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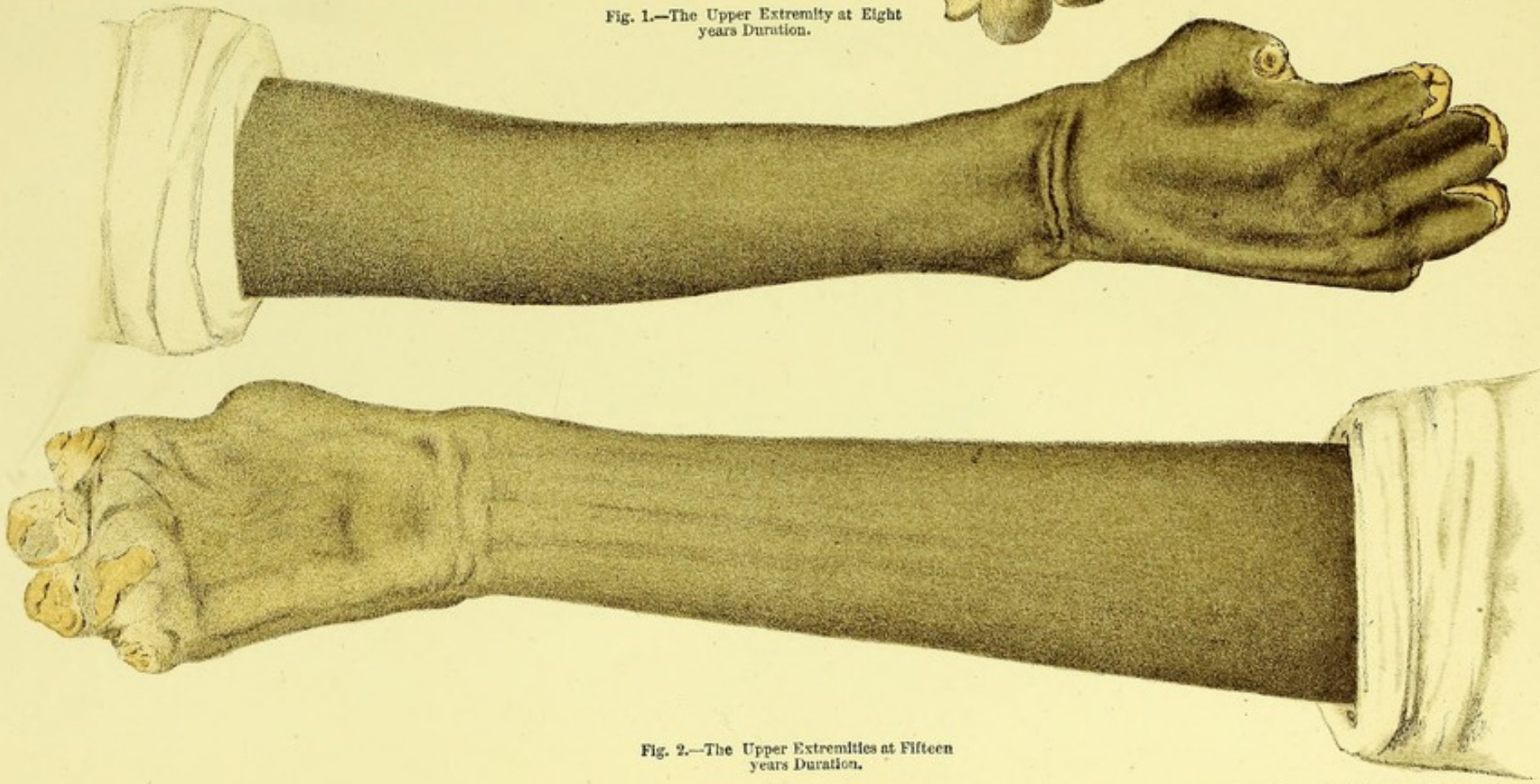

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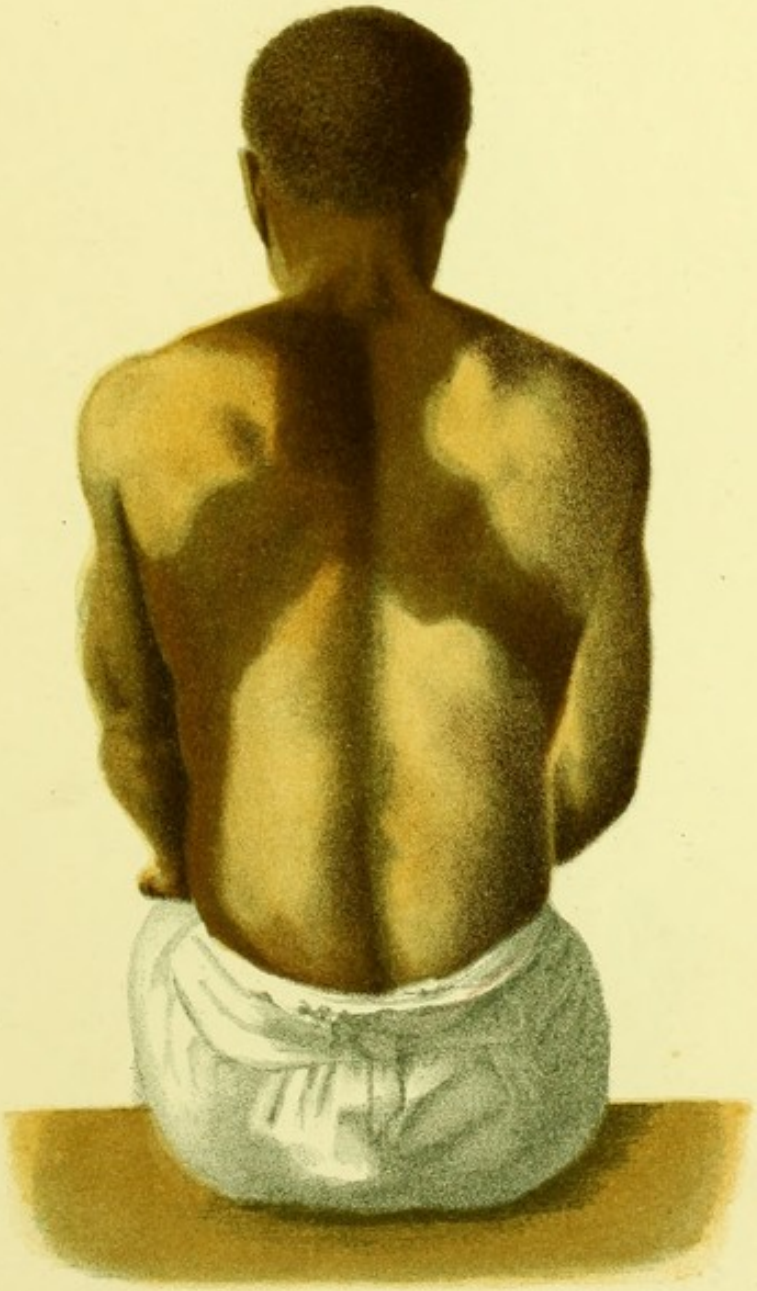
XII.



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Ad nat. del. 1878.

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NON-TUBERCULATED LEPRA IN THE NEGRO.—*From a Photograph.*
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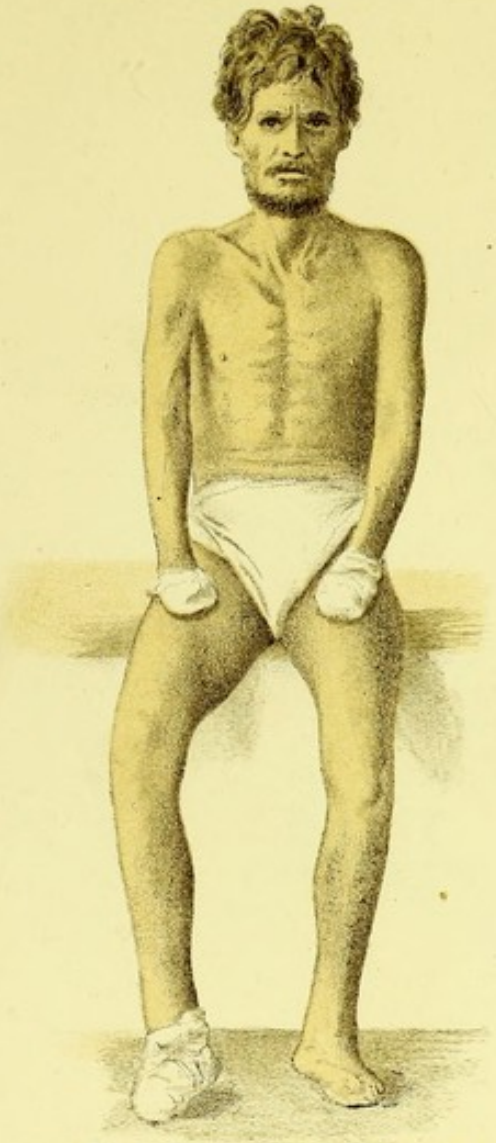

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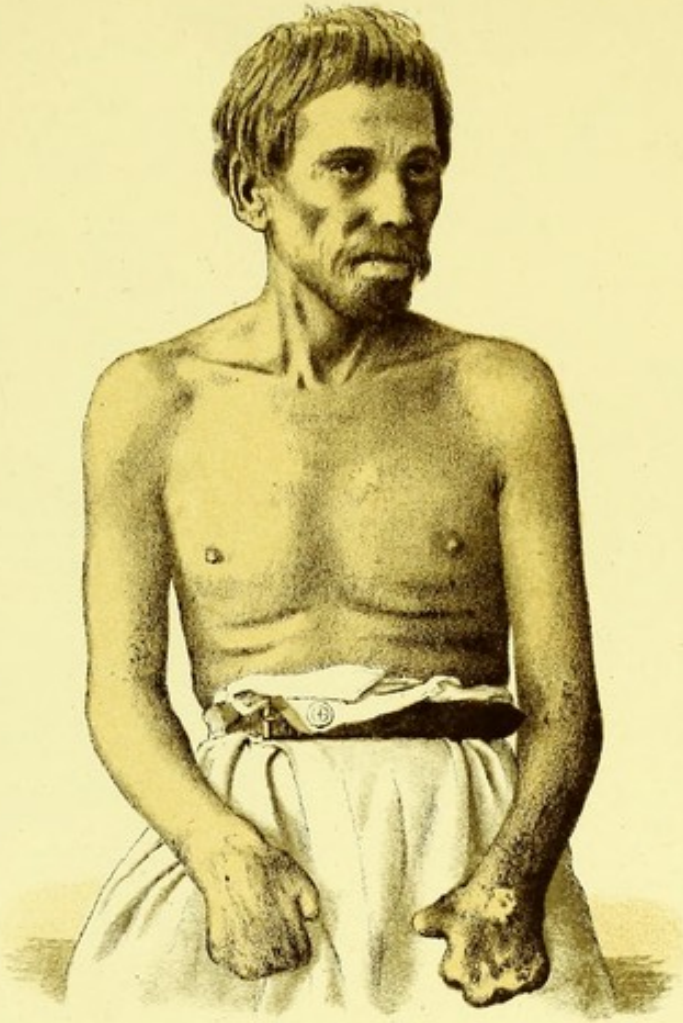

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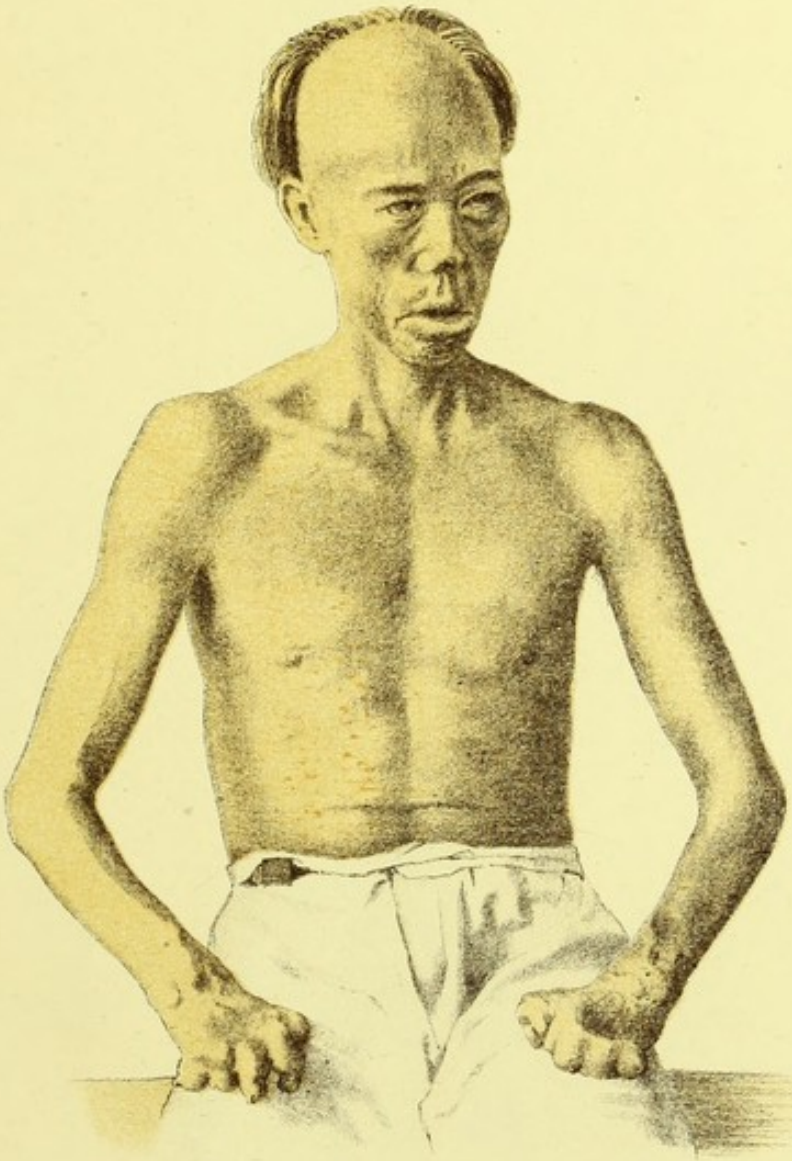

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Drawn and Chromo-Lith by Forster & Co., Dublin.

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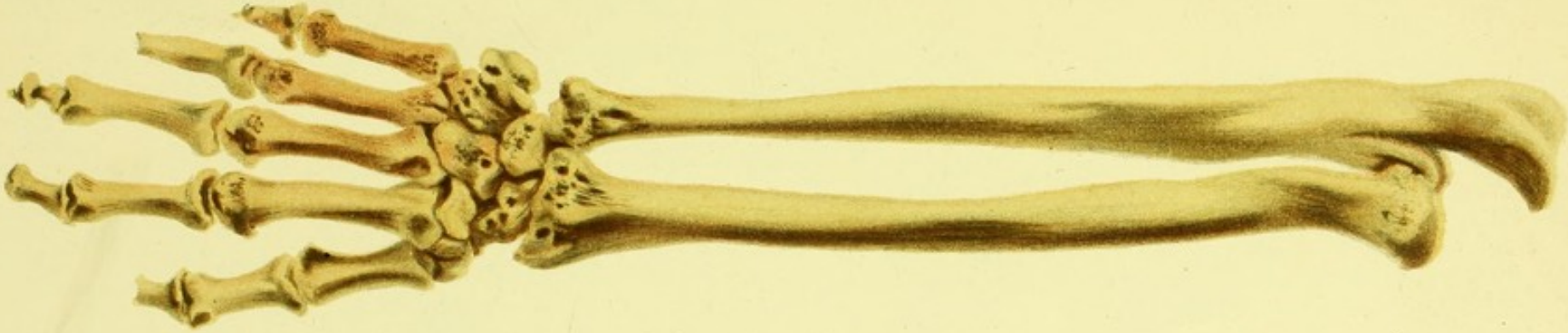

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Drawn and Chromo-Lith by Forster & Co., Dublin.

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Drawn and Chromo-Lith by Forster & Co., Dublin.

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Drawn and Chromo-Lith by Forster & Co., Dublin.

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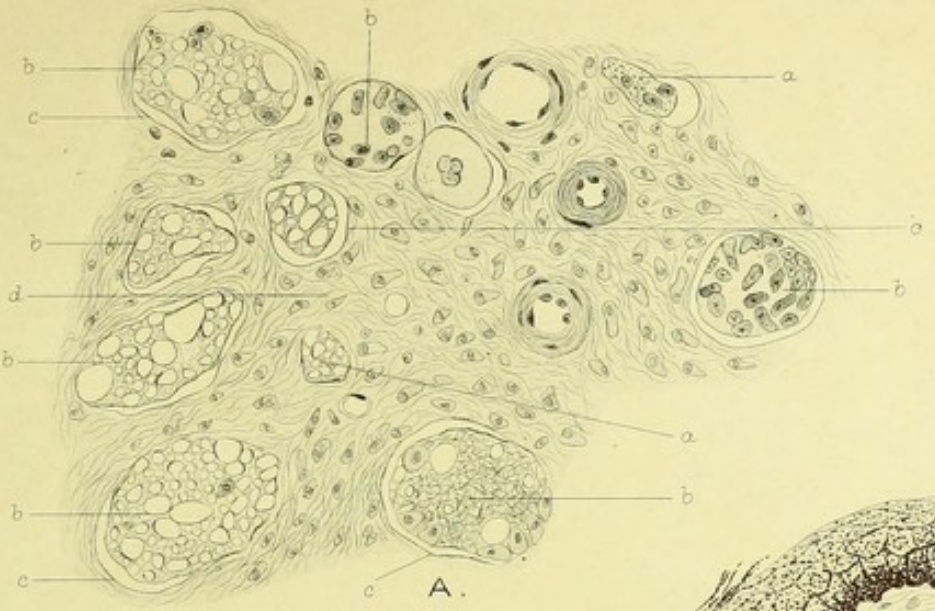
Drawn and Chromo-Lith by Forster & Co., Dublin.

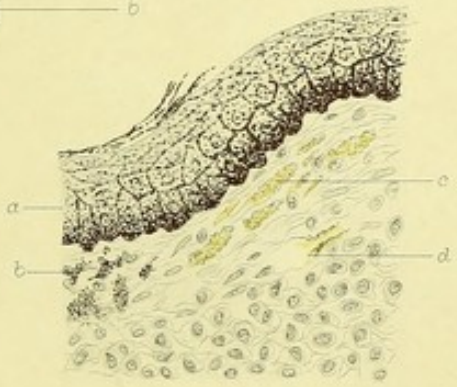
XX.

MIXED TUBERCULATED LEPRA IN THE CHINESE.—*From a Photograph.*

Drawn and Chromo-Lith by Forster & Co., Dublin.



A.



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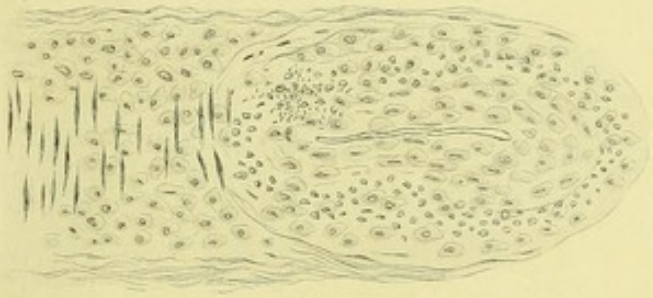


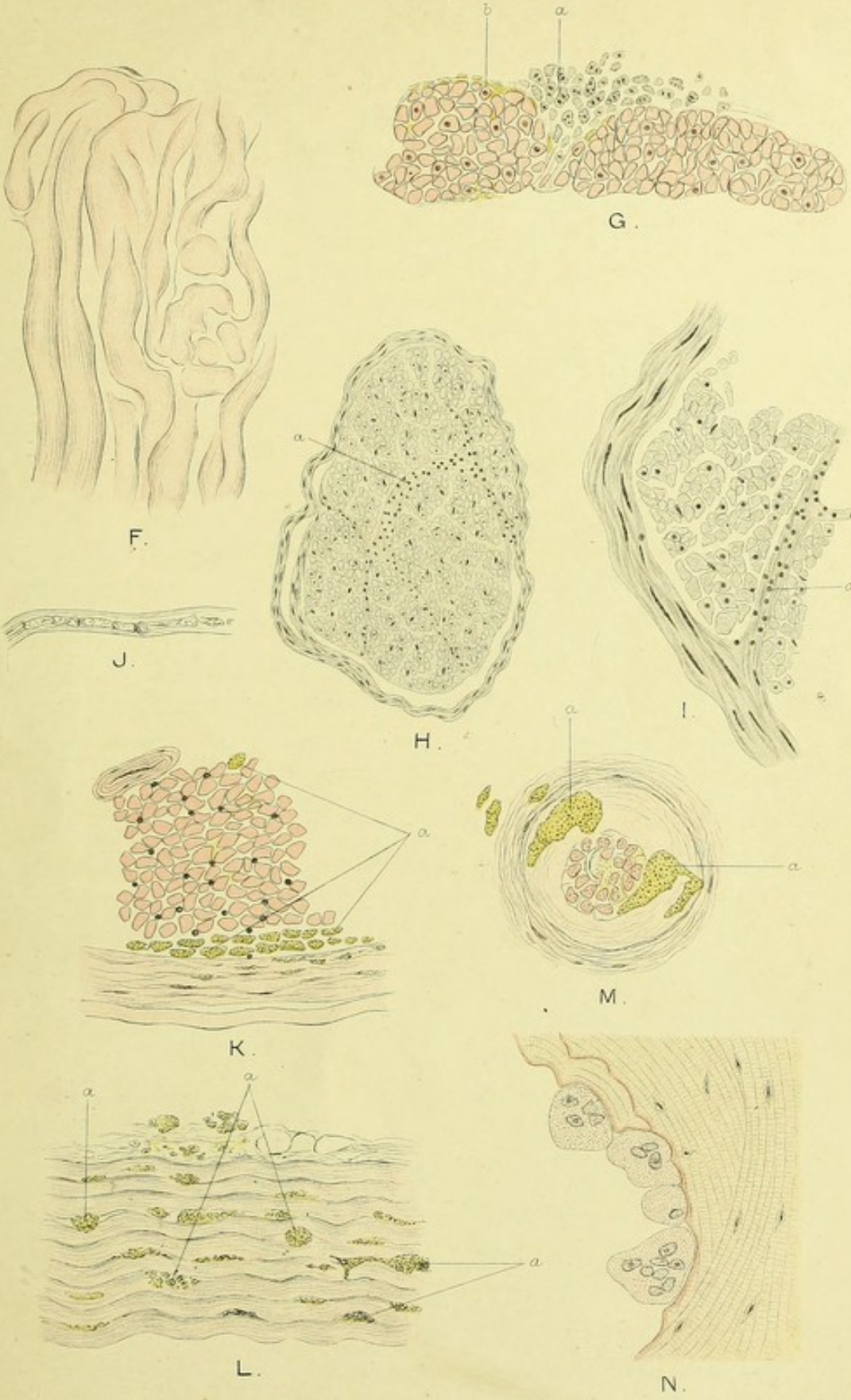
C.

D. E.

The Microscopical Anatomy of Leprous tissue.

E.M.S. del. L. Danielssen Sc.

Mintorn, Bruch imp.



The Microscopical Anatomy of Leprous tissue.

E.N.S. del. L. Danielssen Sc.

Mintern Bros. imp.

LEPROSY

IN

BRITISH GUIANA.

INTRODUCTORY.

TRUE Leprosy, or Elephantiasis Græcorum, the oldest constitutional disease we have any account of, may well be considered the most formidable malady the human race is liable to. The ancient history of leprosy, its chronic course, and fatal character, the resulting deformities, together with its unlimited geographical distribution throughout the globe, make it intensely interesting to the practical physician.

The pathology of the disease will be fully referred to in the proper place, and is only incidentally alluded to here as the deposition of a leprous material, or "new granulation tissue," into the fibro-cellular structures, and in and around the nerve tissues.

Three different "forms" or varieties of leprosy have long been recognized and described—viz., (1) Tubercular, (2) Anæsthetic, and (3) Mixed Leprosy;* the first one corresponding to the seat of this deposit in the fibro-cellular structures of the body; the second to the deposit in and around the nerves; and the third to a form wherein are combined the signs and symptoms of the two former, with, however, certain modifications that entitle it to a separate consideration.

These forms are but different manifestations or phases of one common morbid state, the specific character of the matter

* For which the letters T. L., A. L., and M. L. will be sometimes substituted.

deposited being the same in each, the unity having been microscopically demonstrated.

To the Norwegian physicians we are indebted for a practical knowledge of leprosy, the well-appointed asylums at Bergen having afforded exceptional opportunities for carrying out the necessary investigations into its nature. To their works I shall have occasion frequently to refer.

In Norway the tubercular form appears to be most prevalent, and those authorities in their earlier publications were inclined to regard the three forms of leprosy as so many stages, merely, of the first or tubercular, and they taught that, should the patient live long enough, every case of tubercular leprosy would change into anæsthetic, to finally terminate as one of "mixed leprosy."

I hope to be able to show that each of the forms, T. L. and A. L., may run a separate and well-defined course, and that the disease does not invariably commence as tubercular. In every part of the world where the disease has been described, it has been shown that the duration of tubercular leprosy is within a year or so the same, and my experience for some years at a large leper asylum confirms the opinion I would now express that, tubercular and anæsthetic leprosy are dissimilar in so many particulars, one description could not answer for both; for clinical demonstration, and scientific accuracy, it is essential to describe and treat them as separate affections.

That the Norwegian writers themselves were not clear or satisfied on the subject will appear from the following extract from one of their works:*—"Both forms (*i.e.*, T. L. and A. L.) are independent morbid states which have a separate course, and tend to the premature death of the subject attacked by them."

In Hebra's "Diseases of the Skin" leprosy is placed under the heading "malignant growths," "lepra" (the latter having much to recommend it), and classified thus:†—

* "Traité de la Spedalskhed," Paris, 1848, p. 318.

† New Syd. Soc. Trans., vol. iv. p. 136.

1. Tubercular or tuberous.
2. Spotted or maculated.
3. Anæsthetic.

The words "tubercular" and "anæsthetic" were first used by J. Robinson, Surgeon to the Hospital for Insane at Calcutta, who divided the disease into—

1. Lepra Tuberculosa.
2. Lepra Anæsthetosa.*

These classifications for many reasons are faulty. With regard to Hebra's, there is, it will be seen, an eruption in T. L. as well as in A. L., the term "spotted" or "maculated" cannot therefore be applied to either of these forms. Again, the "spotted" variety, as described by this author, appears to refer to one of the symptoms only of anæsthetic leprosy.

Then, with regard to Robinson's, as there is anæsthesia in every well-developed case of leprosy (although the loss of sensibility in T. L., I believe, proceeds from different causes to those producing it in A. L.), it is manifestly misleading to apply the term anæsthetic to one form or phase of the disease.

They were objected to by a committee of the Royal College of Physicians, who prepared a valuable and exhaustive Report on Leprosy for the Secretary of State for the Colonies in 1867, in which, at page lxiv, they state: "Inasmuch, however, as the terms tubercular, or tuberculous, might convey the impression that leprosy is allied to tuberculosis, it is proposed to designate the first of these forms by the term tuberculated." The word "tuberculated" I have adopted, and now use when describing the severer form of this affection.

Instead of the term anæsthetic, for the reasons mentioned in the preceding paragraph, I prefer employing the term "non-tuberculated," also recommended by the Committee.

The cases alluded to as "mixed," where tubercles as well as the nerve disease are present, differ in many particulars from the others,

* 'On Elephantiasis:' "Med. Chir. Trans.," 1819, vol x. p. 30.

and, as tuberculation is a necessary characteristic, I apply the term mixed-tuberculated to this form of leprosy.

There is no affinity between the disease of Elephantiasis Græcorum and Elephantiasis Arabum, and the term Elephantiasis is, moreover, likely to mislead. I use the word Lepra,* a more suitable one, to designate the disease under discussion, which may then be classified as follows :—

1. Tuberculated Lepra.
2. Non-tuberculated Lepra.
3. Mixed-tuberculated Lepra.

These we will proceed to consider in detail.

* The employment of which to define true leprosy has been advocated by several modern writers. This word may be met with in the writings of Hippocrates, but in connection with such diseases as psoriasis, &c.

CHAPTER I.

Tuberculated Lepra.

Synon.—Lepra Nodosa (*Carter*). Lepra Tuberculosa (*Robinson*). Jazâm, or Da el Ased, the lion-like disease (*Damascus*). Ructa Kusta (*Hindoos*). Koostum coostaragum (*Tamil*). Black Leprosy, Cocobay (*West Indies*). Humid Leprosy. Satyriasis. Bumpy-sick (*Demerara*).

A constitutional disease allied to the exanthemata and syphilis, characterized by a premonitory fever, and an eruption of tubercles.

1. *Premonitory Symptoms.*

Many observers, in different parts of the world, have noted the fact that tuberculated lepra is preceded and ushered in by pyrexia, or other premonitory symptoms more or less marked. I have established beyond a doubt that such is invariably the case, and, that the term premonitory fever may well be applied to the group of symptoms which usher in this disease; the premonitory fever, further, being also preceded by certain prodromata indicative of the approaching illness. A good deal has been written with regard to prodromata in leprosy; objections have been taken, and doubts raised with regard to them, on the ground of their generally coming to the knowledge of the practitioner second-hand, as it were, or by hearsay, and the difficulty of observing cases sufficiently early; but surely they ought not to be discarded on such slight grounds, otherwise much valuable information, often obtainable in no other way, would be lost. The experience derived from cases I have had under observation from the commencement of the disease, as well as the statements of those whose word need not be doubted, and who would have no object in misleading, have confirmed and demonstrated the nature of these prodromata as they occur in this

part of the world, some of which are exemplified in the histories of cases brought forward to illustrate tuberculated lepra.

In addition to ordinary dyspeptic troubles, which may of course precede other maladies, one of the earliest of the prodromata to attract attention is a sense of drowsiness, sometimes accompanied by epistaxis, the former being more intense during the premonitory fever which ushers in the erythematous eruption. The epistaxis appears to afford relief to this symptom, and may continue, at intervals, throughout the course of the disease. The case of Michael A. (p. 27) illustrates the usual premonitory symptoms in British Guiana; this patient felt inclined to sleep, had a disinclination for any exertion, suffered from vertigo, and there was present another common symptom, profuse sweating. M. A. states: "If I could have managed it, I would have required my shirt changed every hour;" his skin had a greasy feel, and he would feel "stiff all over" after any exertion.

This excessive sweating, as well as drowsiness and vertigo, I find are constant symptoms, and foretell the early appearance of the tubercular erythematous spot or patch, the severity of the symptoms being relieved on the advent of the latter. I have merely alluded to the dyspeptic troubles so common in these cases, as they are also associated with the other forms,—gastralgia, cardialgia, &c., being only valuable when grouped with the foregoing.

The following may be taken as the ordinary early history of a case of tuberculated lepra:—Patient may have suffered from small-pox, yaws, syphilis, perhaps severe remittent fever; meanwhile exposed to bad hygienic surroundings, probably living for months in close contact with a leprous person, extensively ulcerated,—in fact, in the best condition to become diseased. He does not regain his strength; dyspeptic troubles appear; he cannot digest his food; he has spasmodic attacks of diarrhœa alternating with chills, which he will attribute to low, or, as the natives and others in the West Indies term it, "*inward fever.*" Soon, disinclination for any exertion manifests itself, the patient cannot move without expe-

riencing vertigo; then drowsiness supervenes, and, he will be subject to profuse sweatings, and to attacks of epistaxis, which, however, relieve him. The premonitory fever which precedes the eruption may at this time make its appearance, the patient thinking he has an attack of colony fever (bilious, continued, remittent, or intermittent). There is increased heat of skin, the thermometer ranging as high as 103°; the tongue is red, and indented at the edges; the pupils are sluggish, until the advent of the eruption, common to tuberculated lepra, marks the fatal nature of the person's illness.

My experience, then, is, that certain symptoms exist by which it is possible, especially in a country where the disease is endemic, to predict the approach of the eruption in this form; that these prodromata are constant, and, in most cases, may be relied on.

The following symptoms I have found to be present in children where there is hereditary taint:—The tendency of sores, or abrasions, to take on an indolent and unhealthy action; the children are also less amenable to treatment for general diseases; their skin sometimes has, in black races, a minute scaly and shining appearance, indescribable variations of light and shade. They have enlargement of the lymphatic glands, with a cachectic look which might well be termed a *leprous cachexiæ;* at the same time they are listless, apathetic, inactive, disinclined to play or work; the features seem coarser, the head appears as if too large for the body, and there is a general appearance of want of symmetry, a consciousness of something being wrong. The functions are not properly performed, and the skin may have a peculiar soapy feel.

Instead of the premonitory fever as described, the disease may commence with febrile symptoms, merged in ill-defined constitutional disturbances, such as malaise, anorexia, some increased heat of skin, a quick, feeble pulse, chills, restlessness, &c. (attributed to getting wet, or mistaken for those of intermittent or inward fever). The attacks are succeeded by intervals of rest, to be again followed by

a recurrence of the fever, and successive outbreaks of the eruption before tubercles make their appearance. Some confusion and difference of opinion on this point have arisen from the fact that, in tuberculated lepra, we have a series of exacerbations, with periods of intermission, each attack being preceded and lit up by a fresh deposit of leprous material, every time giving rise to a similar but modified train of symptoms, the original or preliminary febrile attack in many instances having been overlooked.

That I am in accord with observers in other parts of the world may appear from the following extracts from late authorities, demonstrating the uniformity of West Indian with tuberculated lepra in other countries. Kaposi and Hebra writing of this form state:* "Such persons suffer every evening from attacks of feverishness, slight shiverings, loss of appetite, nausea," &c.; and, at p. 151, under the "*Acute Form*," they say:—"After the prodromal symptoms have existed for a longer or shorter time . . . . the eruption of tubercles and superficial infiltrations of the skin and mucous membrane already described, makes its appearance in common with febrile symptoms of a continued or remittent character. If the fever, which may even assume a typhoid character, persists, the eruption of fresh tubercles and processes leading to softening and disintegration of old ones, with destruction of the surrounding tissue, follow each other in rapid succession."

My contention is that the febrile symptoms which, according to these authorities, precede the eruption of tubercles, precede also the primary eruption, and attend the earliest introduction into the system of the leprous material.

Then, again, with reference to Norwegian leprosy, Boeck remarks: "The complaint often begins with prodromata—viz., oppression, drowsiness, languor, apathy, and disinclination for any exertion; furthermore, a persistent feeling of cold. These prodromata commonly endure from a few months to one or two years; yet it is also noticed that they may last for only a few weeks, or even a few

* *Loc. cit.*, p. 138.

days, whilst, in individual cases, I have noted them as continuing for as long as five years."

In the latter part of this extract reference is evidently intended to a febrile exacerbation, to be hereafter described, which occurs in the course of the disease, for, in five years, tuberculation would be almost complete. This author, among 112 cases, found the disease in twenty-eight to begin with prodromata, and, he adds, "there are grounds for supposing that the same have taken place in many instances, but, in some cases, have not been minutely observed, and, in others, have not, on account of the long duration of the malady, been recollected by the patient."*

2. *The Eruption of Tuberculated Lepra.*

The eruption in this form of leprosy is peculiar to it, and differs materially from that of the non-tuberculated. Few writers have accurately described the eruption I have observed at the leper asylums in the West Indies; this misapprehension may have arisen on account of the omission to describe its appearance in each form of leprosy separately, instead of attempting to describe one skin manifestation as common to all.

I entirely concur in Professor Erasmus Wilson's definition of it: "An erythematous exanthem thrown out on the skin."† In

* Boeck refers to epistaxis and an impetiginous eruption as prodromata in T. L.

In "Traité de la Spedalskhed," p. 195, French translation, it is stated that the drowsiness is so great the patient sleeps in society, at work, and while eating; and the authorsalso refer to lassitude and stiffness of the limbs. "His body is a heavy burden; he hates work; is low-spirited and disgusted with the idea of pleasure; he has wandering chills of the body, and shifting pains in the limbs, and in some cases cardiac oppression and defective appetite; occasionally nausea and vomiting," followed by an *erythematous* or *urticaria-like* eruption.

Another authority, Day, in the *Madras Quarterly Journal of Medicine*, 1860, vol. i., writes of T. L.: "In three native patients pyrexia occurred at the time of the appearance of the *raised, shiny patches;*" to which he gave the name of "*elephantoid fever.*" In "Boy. Trans.," vol. ii., 1853–4, Lisboa states: "The eruption comes as it were in successive crops, being preceded by febrile symptoms, more or less severe."

† Observations on True Leprosy, or Elephantiasis; with Cases. By Erasmus Wilson, F.R.S.: "Leprosy Report, Royal College of Physicians," p. 231.

Celsus ("Medicinæ Libri Octo," Londini, 1837, lib. iii. chap. xxv. p. 100) describes the tubercular spot as at first red, afterwards becoming dark, and associated with

tuberculated lepra there is very early a leprous material deposited in the corium, which, by causing a "local congestion," manifests itself in the leper spot or patch. Professor Wilson asserts there is a succession of "febrile excitement," and "exanthematic exacerbation," with "subsequent rest and repetition," a conclusion I have had ample opportunities of testing the correctness of.

This eruption differs, in regard to colour, in persons of different complexions, being redder and more distinct in dark persons than in fair. In the negro it first appears as a perfectly red or reddish-brown spot, situated on the face or either of the extremities, but more frequently the former. The spot, which begins as an erythematous patch, is raised; it is not surrounded with a halo or induration, and is deeper coloured in the centre than at the circumference. It runs a certain course, may be of all sizes, from a shilling to a saucer, circular or oval in shape, and abruptly terminated by sound skin, which causes it to stand out distinctly from the black background with a greasy, shining appearance. The eruption is as pathognomonic of tuberculated lepra as the light yellow spot with raised edges, depressed benumbed centre, and serpiginous course is of the non-tuberculated form. In the early stages the spot is decidedly hyperæsthetic, and associated with a certain amount of cutaneous

thickening of the skin. The Arabians described the eruption as "red and livid spots," preceding "hard and small tubercles," &c. (Theodoricus in Hensler, "Vom Abendl. Aussatze im Mittelalter").

I am indebted to the "Leprosy Report" for the following references to this eruption in other places:—

In Bermuda, Dr. Hinson reports (p. 6), the first appearances were "erythematous patches of a bright red colour on the forehead, nose, and ears, giving the person the appearance of being over-heated by exercise, and subsequently on the hands, feet, &c. These patches continued thickening until they became distinctly tuberculous, while at the same time the sensibility in them became so acute that the least touch occasioned intense pain."

In Antigua, Dr. Nicolson states (p. 19), "The tubercular form begins with reddish blotches, somewhat resembling urticaria."

In Barbadoes, Mr. Rogers states (p. 26), "Tuberculous leprosy is characterized by the body being covered with livid elevated spots."

In Grenada, Dr. Aquart states (p. 34), "It shows itself by red, irregular patches on the face, extremities, or the body."

The medical officer of the asylum at Tracadie, New Brunswick, described the eruption as "dark red patches in the skin, ½ to 4 inches in diameter."

thickening. In white or fair persons they appear purplish-red or bright mahogany colour, and have been likened to pityriasis versicolor.

On the eruption subsiding, tubercles form on the site of the patches or elsewhere; or, the skin may become extensively infiltrated and mapped out into large tubercular masses or thickenings (tubercular infiltration), which enlarge peripherally, and differ in degree only from ordinary tubercles.

In India, Vandyke Carter thus alludes to the eruption in T. L.* "*Eruption:* It has been already stated that some of the less pronounced forms of 'lepra leprosa' attend this tubercular phase. Commonly these are pale or little raised patches, which seem to be due to combined local deposit and nerve-disease; and there are forms transitional to mere thickening of the skin."

Medical men in that country have made us acquainted with the appearance of the early tubercular spot, in no way different to what I have stated it to be in the West, the above remarks would therefore seem to apply more to a later stage of the disease, or to another form of leprosy. In the eruption of tuberculated lepra there is certainly "local deposit," but I have not found that nerve-disease is necessarily combined, the combination occurring only in non- and mixed-tuberculated cases. It is true that at a subsequent stage there is diminished cutaneous sensibility in the patch or tubercle, but in the first stage there is hyperæsthesia: the anæsthesia here met with, I am of opinion, is not produced by the specific nerve-disease as in A. L., but by mechanical pressure on the nerves by the blastema.

When first seen, the spot may be a mere blush, becoming gradually deeper in colour, and, raised above the surrounding skin, attended in almost all cases by tenderness or burning, more or less severe according to the organization of the patient. Some have described the sensation as of "ants walking over and stinging their face."

As the disease progresses the spot gets more tender to the

* "Leprosy and Elephantiasis." By H. V. Carter, M.D., London, 1874, p. 64.

touch, more elevated, and the surrounding parts will sympathize, as evidenced by swelling, œdema, &c., particularly under the eyes when the spot is situated on the face.

The hyperæmia and hyperæsthesia is sufficiently accounted for by a vaso-motor paralysis of the nervous plexuses, and Professor Wilson, in the Paper referred to, has so clearly brought out this matter, that I reproduce his own words :* "The poison of elephantiasis is unknown. . . . . This unknown poison produces a slow disorganization of the blood; the blood having reached a certain stage of disorganization occasions paralysis of the vaso-motor nerves of the capillary plexus, let us say of the skin; the capillary vessels lose their contractile power, and become dilated; a congestion results; this congestion occurring in rounded spots in the vascular layer of the corium is the exanthema of elephantiasis."

It seems strange so true and simple an explanation has been overlooked or ignored by nearly every writer on leprosy with whose works I am acquainted. The want of opportunity of studying cases from their earliest commencement may have contributed to this.

To resume: the spots may fade, or disappear altogether, or be replaced by other changes—*e.g.*, tuberculation. Before, however, tubercles make their appearance, there may be successive outbreaks, and disappearance of the eruption for weeks or even months, leaving greater contamination of the system after each attack.†

Coincident with the fading of the patches, minute elevations may be seen on their surfaces; these are the commencing tubercles. In fair persons they are at first pink in colour, they may then change to a purplish-red, and finally to a muddy-brown. In black races they commence as small clear-coloured papules, as if they contained serum, but nothing will exude on their being punctured. They may be of all sizes, according to their growth, from a pea to a hen's egg, and occur singly or in groups.

* *Loc. cit.*

† Similar outbreaks and remissions are recorded by Danielssen and Boeck in their joint work.

The blastemous exudation going on, the hyperæsthesia in time will be succeeded by a degree of anæsthesia, which will generally be found present about the time the tubercles have fully formed, the reddish colour of the patch having been replaced by a brown thickened condition of the integument.*

Tubercles are gradual in their growth, and also appear in successive crops, the patient being liable to these further exacerbations on a fresh deposit into the circulatory system taking place, each one being likewise preceded by some degree of febrile excitement or constitutional disturbance.† One large tubercle may be seen surrounded by groups of others in varying stages of development, and as the disease advances they gradually become darker in colour, in marked contrast even to the black skin of the negro. They may then remain stationary for some time, or become

* Referring to this subject Lisboa ("Trans. Med. and Phys. Soc., Bombay," New Series, vol. ii., 1853–4) writes: "The patches of eruption in tubercular leprosy slowly increase, and, as it were, in successive crops, each crop being preceded by febrile symptoms, more or less intense; then the affected portion of the integument becomes tumid, discoloured, shining, and sometimes over-sensitive; but when the fever has subsided, which takes place within one or two days after the eruption of blotches, the tumidity lessens, the discoloration becomes rather less deep, and the pain disappears .... the eruption disappears altogether, to reappear after some time with or without the same train of symptoms."

This description would nearly answer for West Indian leprosy, and not only points to the uniformity of the disease here and in India, but that the eruption in T. L. is accompanied by febrile disturbance, a point on which differences of opinion exist.

Brodrick remarks ("Bengal Leprosy Reports," p. 215) that he had seen a "few cases very early in their career, when the disease had only reached the condition of hyperæsthesia. In these were portions of the integument raised above the level of the surrounding skin about the height of one line; this tract was unnaturally vascular .... in one instance the spots were situated over the malar bone, and were subject to itching, pricking, and burning, especially after eating stimulating food."

Lisboa (*loc. cit.*) states: "When fresh tubercles appear (under febrile excitement) the affected portion of skin becomes tumid, discoloured, and shining, and sometimes very sensitive, but when the fever has subsided, which takes place one or two days after, the *swelling, redness*, and *pain* subside."

Day (*loc. cit.*) observes: "In the preceding stage of tubercles there are dark, raised, bronzed patches, very sensitive, sometimes oily. In three cases febrile symptoms accompanied them; exposure to the sun or taking stimulating food increases the irritation."

I could quote other authorities to show an analogy between tuberculated lepra and the exanthemata, as well as the nature of the febrile disturbance which accompanies the eruptive stages in other places.

† Lisboa (*loc. cit.*) states: "The tubercles, like the blotches, generally appear in successive crops, sometimes being preceded, like them, by febrile symptoms."

absorbed; atrophy, ulcerate or suppurate, leaving a characteristic white vaccino-like cicatrix behind.

With regard to the time occupied in the various eruptive stages of tuberculated lepra, the eruption of patches may go on, as I said, and subside before finally proceeding to tuberculation, but from three to six months, from the appearance of the prodromata, will be generally found to elapse before tubercles make their appearance.

In place of tubercles forming, the patch may become thicker and more raised owing to the deposit, constituting what has been termed tubercular infiltration or tumefaction, oval and circular patches of which, of various sizes, may be found on the body; frequently these coalesce and form one large mass which may cover both fore-arms, or the greater part of the front of the chest, lower extremities, or the abdomen. Or it may be arranged in dark brown rings, with sound skin in the centre, and a degree of anæsthesia in old cases.

This constitutes a much milder form of leprosy. I have only observed it in white or fair persons, such as Portuguese, Chinese, or coloured Creoles; unless caused mechanically, I have never seen ulceration in connection with this form, as far as the patches are concerned. It is also more amenable to treatment, and when it subsides leaves only a darkish stain behind. It usually commences as a dark red or purplish spot, having the same shining, greasy appearance as the others, and, in addition to the sites mentioned, may sometimes be seen on the face, rough and tender to the touch. They are preceded and accompanied by the general symptoms of tuberculated lepra, but milder.

These patches may end in resolution, or subside and reappear again. They are raised above, and darker in colour than, the neighbouring sound skin, the dilated sebaceous follicles, with their greasy look, giving an appearance not unlike the rind of an orange *when it is squeezed between the fingers.*

The most frequent sites for tubercles are the head and face (except the hairy scalp, where I have never seen them), the ears,

membrane of the nose, on the extremities, on the nipple, on the mammary gland, the scrotum, prepuce, around the anus or vagina, and in the arm-pits; they are scarcely seen over the elbow or knee-joints, but, with the exception of the scalp, they may appear on any part of the body; they are rare on the back, the neck, soles of the feet, or palms of the hands. The glans penis I have never seen affected.

The primary eruption almost invariably appears on either cheek or temple, the forehead, the anterior aspect of the fore-arms, or the outside of the thighs. The conjunctiva and cornea are often the seat of tubercles, as well the tongue, inside the mouth, throat, and certain internal organs referred to under the head of Morbid Anatomy. Tubercular infiltration I have seen on the forehead, back of the chest, fore-arms and hands, but rarely on the thighs and legs.

This eruption may, among other things, be complicated with a certain squamous state of the skin, which is liable sometimes to mask the disease. Patches of scabies also frequently occur in conjunction with it, and when the patient scratches and irritates the parts, the features of the leprous disease are altered, and might mislead the inexperienced.

A peculiar mottling of the skin on the abdomen, and between the shoulders, accompanies advanced tuberculated lepra in black races, most frequently met with in young persons, and those with the darkest skins, but more especially where there is hereditary taint. On the belly it appears as numerous, indescribable light and dark shadings, not unlike the staining of some rare colonial wood, whilst on the back it appears as if mapping out the spinal cord. It remains without any alteration, and is not attended with loss of sensation, or any change in the true skin so far as I could make out. It does not correspond to any eruption I have ever seen or read of, and although I can give no explanation as to its nature, it is nearly always present in these cases as described.

3. *Description of Tuberculated Lepra.*

Having described the premonitory symptoms and the eruption, a

general description of tuberculated lepra, as met with in the West Indies, may now follow.

The appearance of the leper spot or patch is usually the first thing that attracts the attention of patient and physician to the nature of the illness. The spot, I have stated, was the direct result of the deposit of leprous material, which will soon be followed by other symptoms pathognomonic of the disease. One of the earliest is puffiness under the eyes when the eruption is on the forehead, or an œdematous condition of the parts in their immediate vicinity.*

The perspirations noted amongst the premonitory symptoms, although not so profuse, still continue; the spot having at first been tender, red, or itchy, and raised above the skin, will have subsided prior to the appearance of tubercles; it will also have become darker in colour, and in rare instances somewhat anæsthetic.†

The temperature of the body at this stage is not much disturbed; towards evening patients may complain of feeling colder, and the disease may remain stationary for some time, until a febrile paroxysm, due to fresh infection of the blood, arises, when the pulse is quickened, the temperature rises, and it is hastened on. The progress the affection is making is best indicated by the relative frequency of these developments or constitutional exacerbations, which will be again alluded to.

In early cases, more particularly in children, numerous small tubercles may be seen on the margin of the lips, others of larger size being developed elsewhere.

In this stage the skin of the forehead is highly characteristic; it has a thickened shining appearance as if polished, the natural folds are enlarged, subsequently to be subdivided into tuberculated

* (Case I.) In one of the asylum cases, Ng Yen Laong, Chinese, male, aged 36 years, within six months of the appearance of the erythematous patch the appearances noted were: Patch on the forehead has faded; skin of the part thickened and infiltrated; enlargement of the lobes of the ears, which are still red in colour. He is just over a febrile paroxysm; there is puffiness under both eyes as in general anasarca; enlarged glands in both groins; an unhealthy-looking ulcer on the right leg.

† This is generally a later symptom.

masses. The cheeks are either covered with tubercles, or thickened, greasy looking, and becoming pendulous. The lips are tuberculous and everted, on account of their swollen condition; the ears stick out from the face from the same cause.

Should the disease have commenced before puberty, the physical and mental development of the boy or girl will have been retarded, and the natural functions delayed. The beard does not grow, the head appears too large for the body, and there is a want of symmetry observable in various parts.

With regard to the organs of generation, in the male the testes atrophy, and in females menstruation is delayed long past the usual age.

In the meantime the tubercles are growing larger, the skin, from hyperaction of the sebaceous glands, still oily and shining. The lymphatic glands early sympathize with the surrounding disorganization, and enlarge. I have not seen a well marked case of this form of leprosy without enlargement of the femoral glands, which are like symmetrical tumours in the groin, so large are they. As the disease advances they become more prominent, the enlargement occurring below Poupart's ligament when the disease is on the feet and legs; in the neck they enlarge from irritation of the tubercles on the face, and in the axilla from those on the upper extremities. They get smaller on the subsidence of the irritation caused by each fresh eruption, but never entirely disappear. They are alluded to by lepers as their "sentinels" or "barometer," for when they enlarge and become painful they are aware a fresh exacerbation is about to take place, or a fresh outbreak of ulcerations is at hand.

Some of the Plates illustrate this condition of the glands as occurring (1) in the groin, and (2) in the cervical region, the result of tuberculation and ulceration in the neighbourhood.

Mention has often been made of the febrile attacks accompanying fresh developments of these tubercles. They are nearly always preceded by pain and aching of the limbs, determination of blood to the head, relieved by bleeding from the nose, and fever

more or less severe. The latter has sometimes a temperature as high as 104° Fahr., with a pulse of 120 or more, and occasionally proves fatal.

There may now commence the most troublesome symptom the tuberculated patient has to endure—viz., extensive ulceration, which may take on a phagedænic character, and, spreading rapidly, severely undermine the general health. This usually begins on the lower limbs by a tubercle first softening, then ulcerating, and may involve the entire circumference of the limbs. The resulting sores are unhealthy and indolent; they have a sharply-defined border, a red glazed appearance, with a glairy mucous discharge. When they are healed, numerous sclerous-like patches remain, thinner than the surrounding parts, and slightly anæsthetic. The yellowish humour which exudes has an odour, *sui generis;* it is one of the greatest evils to be contended against in leper asylums, and in neglected, overcrowded establishments it has been known to give rise to a low form of fever which has decimated the inmates. I have seen men with hardly a hand's-breadth of sound skin on their bodies, if we except the head and face, and palms of hands.

Danielssen and Boeck refer in their work* to the supposed influence the drying of such ulcerations has on the general health of the leper. Bergman† endorses their views, and states: "As long as the ulcers caused by the disintegration of tubercles continue to discharge pus, &c., the patient feels comparatively well; no sooner, however, have they healed than fever and a grave constitutional disturbance sets in."

I have not found that any such danger attends the healing of the ordinary leprous ulcerations; it is done at the asylum every day. When, however, the metastasis of leprous material is taking place, and the limbs and joints swell, the ulcers dry up or stop discharging, fever sets in or other constitutional disturbances arise which are erroneously attributed to the ulcerations healing, but may be scientifically accounted for on other hypotheses.

* *Loc. cit.*, p. 40. † "Die Lepra in Livland," St. Petersburg, 1870.

In the non-tuberculated form there will have to be described the processes by which mutilations of certain joints or parts occur, but such lesions, the result of necrosis, caries, or interstitial absorption, are not met with in tuberculated lepra, in which form only *necrosis of tissue* takes place.

In continuation of the description, I will now describe a remarkable perversion of Nature which occurs in T. L., and which has not, to my knowledge, been described before. In one case (No. XII.), depicted in Plate 2, Fig. 4, an adult male, some two or three years diseased, the testes from atrophy were only half the natural size, and all virile power was lost; the hair had fallen out from the pubis, and none had grown on the face; whilst the mammæ had enlarged to the size of a fully-developed woman's, the features generally having as much a feminine as a masculine look. The enlargement of the breasts was not tubercular; tubercles were on the nipple, enlarging and elongating it, and a few might be seen studded on the glands, which enlarged, *pari passu*, with the usual leprous changes. It may be seen from the note below* that it is common for the nipple to be enlarged from tuberculation; this is, however, quite different from the condition of the breasts in C.'s case, photographed in the first instance from life. I have met with many similar among cases of tuberculated lepra.

In females the mammary glands are not specially affected, tubercles may be seen on them as well as on the nipple, but I have not observed this so frequently as in the case of males. In tuberculated women we have menstruation delayed, irregular, or absent altogether, and gestation seldom taking place.

Falling out of the hair has been mentioned, but it is by no means so early a symptom as is generally believed. It occurs, as a

* Dr. Bakewell, Med. Superint. Leper Asylum, Trinidad, writes ("Correspondence relative to an Alleged Cure of Leprosy"): "One peculiarity I have noticed in a very large proportion of males, and that is, the *nipples* are early attacked by tubercles and then become enlarged. So common is this that, in order to save time in note-taking, I gave this peculiar condition a name, and noted them as 'feminine nipple.'" It will be observed Dr. Bakewell makes no reference to the actual enlarging of the mammary glands, the other being of common occurrence in the same way as other parts of the body are disfigured or enlarged.

rule, when the disease is somewhat advanced, and in this statement I am borne out by Boeck, who states that "the growth and development of the hair in general seems not to stand to any fixed relation to the extent of the disease . . . . abundant growth of hair may be met with in advanced cases of (tuberculated) leprosy." This falling out occurs in situations where the leprous material is deposited, which, in my opinion, may mechanically extrude the hairs, the eyebrows being the first to suffer, although any part is liable to be thus affected, except the head.* It has been stated that tubercles are never seen on the scalp, and from the cases which follow, illustrating the disease, it will be seen that the hair of the head seldom, if ever, suffers.

Another symptom very common at this stage is a gleety discharge from the urethra, such as I have sometimes met with in gouty subjects.

The extremities, as well as the face, are parts of the body specially affected in this form. The back and sides of the hands and fingers become swollen, and covered with tubercles; the fingers stiffened, bent, and widely separated from their fellows on account of the œdema, and thickening of the skin; they are clubbed at the ends; the nails are horny, fissured, or raised from the deposit beneath them. In their efforts to stretch them out or use them they become cracked, and unhealthy sores result, which may last for months. The palm of the hand also becomes fissured, horny, and scaly, from disuse or mal-nutrition, *but not anæsthetic.*

Similar changes take place with regard to the feet and toes; the skin of the sole is rendered very sensitive from the swollen condition, and the patient walks with great difficulty. The legs, further, commence to swell, leading to gradual but permanent hypertrophy.

The mental faculties remain unimpaired throughout the progress of the disease.

The mucous membrane inside the cheeks, nose, fauces, and the tongue may be seen studded with tubercles. The tongue is swollen,

* In T. L. the hairs drop out a few at a time. In nerve-lepra the hairs on the affected parts turn white.

fissured, denuded in parts of epithelium, the papillæ very prominent, and the organ sometimes presents two or more large globular tuberculated swellings, red, tense, and shining, around which smaller ones may be seen, some in process of ulceration. The velum may be lost, as in syphilis, but this occurs only when the disease has existed for three or four years.

The peculiar snuffling so common among lepers from implication of the Schneiderian membrane, and the croaking voice from the vocal cords* being affected, now become markedly characteristic, more so as the disease progresses. Speaking through the nose may be complicated with difficulty of breathing, from tubercular obstruction, and bleeding from the nose occasionally still occurs.

With regard to the limbs, periodical cracking and fissuring are experienced, leading to a discharge of bloody serum, from which relief is experienced in the swollen parts. Relief is also felt when tubercles ulcerate and discharge; in fact, incisions are made by the lepers themselves into the legs to allow a flow, so well are the good effects of this procedure known and appreciated.

The nails loosened by the deposit fall off, leaving unhealthy sores behind; they are, however, replaced by fresh ones, but they are peculiar in being badly developed, thinner, appearing as if split in longitudinal pieces, and they speedily decay.

The face will have assumed a more sinister aspect from the larger folds of tuberculated skin on the forehead, and the isolated pendulous tubercles rendering the furrows yet more prominent. The eyes are congested from deposit in the conjunctiva, and when the cornea is similarly affected, a sort of pannus results, the patient has a peculiar staring, fierce look in consequence, intensified by the absence of hair on the eyebrows and lashes. Tubercles depend from the pinna and helix of the ear, which are generally enlarged, and others have formed on the alæ of the nose, within which thick dirty scabs may be seen. Others will have formed on the chin,

* After death I have found the true vocal cords and the epiglottis ulcerated and the seat of tubercles.

lips, but rarely on the neck ; the aspect of the patient is thus completely altered, his lips are pendulous and everted, and the expressions elephantine, leonine, &c., have been used to describe their appearance.

One inmate of the asylum, Richard G——, is called the "elephant," from the appearance of his face, particularly the mouth.

In various parts of the same patient may be noticed tubercles in different stages, some fully developed and stationary, others discharging or ulcerating, others again undergoing absorption, and surrounded by lax cuticular appendages. Generally, it may be stated, that the later the tubercular growth, the more permanent.

The senses of taste and smelling are impaired, but not that of hearing. Patients often become myopic, perhaps from the overhanging condition of the eyebrows. The gums are tender, bleed readily, and the teeth, loosened in their sockets, fall out in consequence ; tubercles enlarging and ulcerating in the air-passages have caused death by asphyxia.

Although the glans penis is not affected, tubercles form on the prepuce and scrotum, enlarging these parts, and giving rise to many absurd and incorrect ideas as to increased virile power in T. L. In boys, retention of urine is common from this tuberculation of the prepuce, and circumcision has to be performed for its relief, the wound healing kindly and rapidly.

The order of events may be briefly stated to be—(1) deposit ; (2) eruption ; (3) tuberculation, which may be accompanied by (4) anæsthesia, when the pressure of the blastema is more than ordinary ; (5) ulceration.

In about nine years the disease will have reached its climax, unless it has been hastened to a fatal termination by some complication which will presently engage attention, or arrested by proper treatment.

Towards the end, the unfortunate patient will be bed-ridden from the ulcerations, his nights sleepless, the day passed in misery and isolation ; his legs have become hypertrophied, the internal

organs suffer from the leprous deposit until the whole system is poisoned, and the wretched sufferer dies worn out by the ravages of one of the most fearful maladies that man could be afflicted with.

4. *Febrile Reactions.*

The febrile reactions occurring in the course of tuberculated lepra were alluded to in the description of the disease. I desire to revert to this matter more fully, as it is of some practical importance, and only, as a rule, observable in properly-conducted leper asylums. Some authorities consider, and among them Dr. Vandyke Carter, that febrile symptoms if they occur at all in the course of the disease, do so more frequently, if not entirely, in European countries, but it will be seen that they are also common in tropical, and sub-tropical countries. I am not now alluding to the delirium or fever which sometimes complicates the case, but to the febrile exacerbations which attend a fresh development of tubercles, their softening externally, with or without a fresh deposit internally of leprous material. From my notes I find these attacks occur about four times in the year, or at the change of seasons, particularly so at the commencement of a very wet one.

The ordinary symptoms are fever, headache, itchiness of the skin, pain and tenderness over joints, liver, and spleen, swelling of the joints and limbs, enlargement of glands, thirst, vomiting, constipation (or even diarrhœa), which may last for two or three days, or until the erythematous patch or tubercles make their appearance, when the symptoms subside, followed by more or less exhaustion.*

The fever begins with rigors, and is attended with a quick

* Hebra and Kaposi (*loc. cit.*, p. 152) state: "We are of opinion that the fever has sometimes the same significance as that which accompanies the eruption of variola or roseola syphilitica, and is sometimes, as Hansen also believes, the expression of a metastatic process. In those cases where many tubercles soften simultaneously, there is an evident cause for the absorption of a material undergoing decomposition, and for the febrile reaction, and a renewed outbreak of the process may occur on the surface—that is, the simultaneous softening of some tubercles and the development of others; or metastasis to internal organs may occur, as has been shown by appearances found after death; or elimination may take place by means of other well-known processes (excretion). Since, however, lepra presents the characters of a constitutional disease, we are justified in regarding the febrile excitement of the first stage as due to some toxic influence."

pulse and high temperature, and arrest of the secretions, but no albumen in the urine, which only occurs when albuminous nephritis complicates the case. It is most intense when fresh deposit is presumably taking place in the internal organs, leading then, it has been reported, to delirium, or even death, the degree of fever being in proportion to the amount of this internal deposit, which is undoubtedly great when the temperature reaches 105°.

The tongue is coated, red, and glazed at the tip and edges, drowsiness gives place to intense headache and congested eyes, the quantity of urine is increased, and the face has an œdematous puffy look. The case may be stationary, when a change takes place in the weather (although this is not necessary), the sores will cease running, the glands in the groins enlarge, and then pyrexia sets in, followed by a gradual subsidence, but leaving the unfortunate sufferer more prostrate than before, and sometimes thinner, visible emaciation having taken place in several cases during the attack. These paroxysms are easily distinguishable from ordinary intermittent or remittent fever, and although they do not often prove fatal, by each fresh invasion so much more is the patient weakened, and the termination of the case drawing to a close. Any one observing them, and the temporary relief following the appearance of the eruption, could not for a moment doubt that the cause was a systemic infection. Day's "*elephantoid fever*" has been well named, and this term, or tubercular or leprotic fever, might be retained to signify the occurrence of these febrile paroxysms. Lepers believe that arrested secretion produces these attacks, and some practitioners have adopted this view. The former observe that it is usually preceded by a drying up of their sores, and hence their desire to keep them open, as well as a good drain in the feet and legs when these are swollen. I have noticed, prior to an attack, several large tubercles in process of softening, and the fever may be due to direct absorption into the blood of morbid material (*pyæmic?*). The fever occurs just as frequently in females as in males, but more common in the young of both sexes.

As the disease progresses, longer intervals occur between the attacks, and after the disease has lasted five or six years, they almost disappear. They are not met with during any part of the course of nerve-lepra, in which form a slight degree of pyrexia may or may not accompany a local swelling, the consequence of periostitis and necrosis of bone, which disappears on the tension of the parts being relieved by a free incision, but is very different from what I have just been describing.

With regard to the "Acute Onset of Tubercular Leprosy" mentioned by some writers, I need not say much; no cases of it in detail are given in "Traite de la Spedalskhed," and the symptoms, as described, are not different from those I have noted as ushering in the disease, or that attend a febrile paroxysm. The case of Dr. Bakewell of Trinidad,* which is given as an example of the "Acute

* *Loc. cit.*, p. 34:—

"W. T., white creole, father an Englishman, mother a white creole. Is the son of poor parents, and lives in a very unhealthy part of Port of Spain. Up to a few weeks ago was always in good health and a very hearty eater. He went down to the Islands in the Gulf of Paria about four months ago to visit an uncle; while there his diet was very bad; he bathed when very hot. Remained a fortnight; and when he returned was sickly, and had slight fever. He continued feverish till about four weeks ago, the fever then became much more severe and continuous—that is, without intermissions—but was worse at night. At the same time the father observed a breaking-out of pinkish patches on the cheeks. The appetite from being large became voracious, so that he would eat till vomiting came on. He complained of headache, rambled in his sleep, and was sometimes delirious.

"*Present State, Nov.* 22, 1870, 1.30 P.M.—Skin hot to the touch; temp. 104·2° F.; pulse, 126; respiration, 36. No tenderness or pain in iliac fossæ, no diarrhœa. Very thin, but not exactly emaciated. Complexion fair, with flaxen hair. On the cheeks are large, flat, shining patches closely resembling those of *erythema nodosum*, much redder than the surrounding skin; redness disappears momentarily under pressure. The same kind of patches were found thickly scattered about the whole of the trunk and limbs. On the trunk they are not quite so deep coloured, or so much raised from the surrounding skin. The ears were natural. There was no anæsthesia or numbness, but there was some hyperæsthesia, as he complained of the skin being sore, and if any one touches him he cries out. Is weak, but can sit up. Hands and feet are swollen, but not œdematous; no albumen in the urine.

"*Nov.* 25*th*.—Just in the same state; temp. 104·8° F.

"*Nov.* 28*th*.—Is much less feverish (temp. 100°); skin not sore; spots not so prominent.

"*Nov.* 30*th*.—Much less fever yesterday and to-day; redness of the patches has disappeared; they have become level with the surrounding skin, purplish, rough, and slightly squamous; no anæsthesia; swelling of hands and feet persists; temp. 98·6° F.

"*Feb.* 2*nd*.—No return of the fever; patches are somewhat paler, but still persist, and are scaly."

Onset," differs only in severity from the symptoms I have described in the preceding paragraphs.

5. *Cases in Illustration.*

The following are intended to be illustrative of the foregoing observations, the patient in every instance having been under the immediate cognisance and care of the author :—

CASE II.—*Early Tuberculated Lepra in a Portuguese.*

Francis P. D——, shopkeeper, aged 46 years, from the city of Georgetown, presented himself at my surgery on April 1, 1880. He was unwilling to give any account of his family history, but stated that he believes none ever had leprosy. He is acquainted with a patient of mine, another Portuguese, who also is suffering from leprosy. His present illness came on with a feeling of malaise, and repeated attacks of what he terms "colony fever," accompanied with great drowsiness, the last attack of which ushered in an erythematous spot on his forehead.

State and Condition on Examination.—There are thickened, red, raised patches occupying the centre of the forehead, nose, upper lip, and part of each cheek, which feel doughy when held between the fingers. Those on the cheek are just fading. His fingers, hands, and part of forearms are red, oily-looking, and swollen, showing plainly the openings of the sebaceous follicles, and *appearing as if greatly burned with the sun.* Similar patches to those on the face are on the abdomen ; these are of various sizes, one, that of a crown-piece, is not as much raised as the others. He is just over a febrile attack, and still feels drowsy and stupefied; pulse 92. As he sits near me the perspiration pours from him, and he keeps mopping away at his person, particularly the head and neck. The fingers are painful to the touch, and so are the spots on the body ; the latter are redder than those on the cheeks, and fade on pressure. At a distance, the man looks as if his face was swollen and severely

burnt by exposure to the sun. This case will be one of Tubercular Infiltration.

CASE III.—*Confirmed Tuberculated Lepra in a Negro, with History of Invasion.*

Michael A——, aged 37 years, black, native of British Guiana, from Craig village, Rio Demerary, is one of fourteen sons. His father died in 1875 of dysentery; his mother in 1870 of "fever." His parents and grandparents were free from any leprous taint. He had small-pox and yaws (frambœsia) before contracting leprosy. Seven years ago, then 30 years of age, and apparently well in health, he slept one night in the city with a mulatto woman. On awakening in the morning he saw, to his horror, that her fingers were contracted, and that she had other signs of "joint evil."* This discovery preyed on his mind; for the next few days he felt ill and feverish, and, what at the time was considered a chancre appeared at the side of the penis, which was followed by enlargement of the glands in the groin. These glands have so remained to this day. The ill-health continued, and he was greatly debilitated; he suffered from pains in the bones, and for five months was confined to his bed. He was treated for syphilis, but got no better; under iodide of potassium he improved a little, but on endeavouring to work he would sweat profusely on any or the least exertion. His skin felt greasy, "as if rubbed with lard," and, "if he could have managed it, would require his shirt to be changed every hour." He had vertigo, and a constant desire to sleep. About twelve months after having slept with the leprous woman, he was out one morning when he was suddenly seized with fever and vertigo; he had to return home, and fell into a heavy sleep. When he awoke there was a raised, reddish-looking eruption over his face; it felt rough to the touch and painful, hot and moist, and "as if fowl nimbles were walking over it." The drowsiness persisted, and although

* Non-tuberculated or nerve-lepra, the most prominent signs of which are deformities of the fingers and hands.

he would be in a perspiration, the skin felt hot and he was very thirsty; he lost his appetite, and felt very ill. The patch on the face remained much the same for nearly two months, when it got darker in colour, thicker, more uneven, and nodulated. With similar but milder symptoms another patch appeared on the anterior middle third of left thigh; subsequently smaller ones appeared on the front of the chest, front of the left arm, and outer part of the right leg. The hairs from the eyebrows now began to fall out—leaving the eyelashes intact—and also from the chest, axillæ, and pubis. All this time tubercles were growing on the site of the patches, his voice became changed, his nose affected, and he was subjected to epistaxis daily. In this state he was admitted into the General Leper Asylum. There was then an ulcer on the dorsum of the foot where a tubercle had ulcerated, and after admission his feet became swollen and tuberculated. Other tubercles ulcerated, and gave rise to extensive sores which confined him to the Infirmary for some months, but his health improved under tonic treatment and wholesome food.

On November 10th, 1877, his fore-arms and hands were swollen, the skin hot, his pulse 110, and the temperature went up to 104° Fahr. in the arm-pits. During this fever a reddish patch appeared on the left fore-arm, while minute papules might be seen on other swollen parts, but only on the anterior aspect of the body. He was treated with quinine, baths, &c., and the attack passed off. He afterwards suffered from similar exacerbations on the appearance of either a fresh patch, or successive crop of tubercles. Latterly the intermissions have been longer, and the disease more stationary.

In using the hands the fingers crack and fissure, and a bloody serum is discharged, having a peculiar and unpleasant odour. Small, hard tubercles may be seen on the tongue and soft palate; his sense of taste is impaired, and also that of smelling, but his hearing is not affected. Tubercles have formed on the conjunctiva, causing great irritation and congestion. His gums are soft and bleed easily, and some of his teeth have fallen out. His ears are enlarged and

tuberculated, sometimes they itch, and the scratching causes unhealthy-looking sores. The pubis is devoid of hair, his testicles are undergoing atrophy, and he has lost sexual appetite; he never suffers now from nocturnal emissions, which troubled him when younger.

Since 1878, the disease has been *in statu quo*, and he has improved under treatment with gurjun oil. His skin is very tender, and the slightest scratch causes it to bleed. When ulceration to any extent is going on in the feet and legs, the glands in the groin sympathize, by becoming painful and larger; as soon, however, as the ulcerations heal they subside, but never entirely disappear. He says, "the enlargement of these glands is a notice to us when anything unusual is the matter with our feet and legs." The nails are dropping off his toes; they were pushed up and loosened, the parts underneath ulcerated, and the nail then fell off. A new nail sometimes forms, but differs from the old one in being thinner, in separate pieces, and soon drops off also.

Patches of scabies repeatedly form in various parts of his body, requiring the application of a parasiticide. The beard remains, but the hairs are thin and scanty. The hands are clumsy and stiff from their swollen condition, but there is no loss of feeling, and the interosseous muscles are wasting. The peculiar mottling of the skin, alluded to when describing the eruption, is well marked, having come on within the last three years. This man is now (1879) covered with tubercles on the face, ears, arms, legs, feet, and front of the chest. The earlier ones softened and shrivelled up, the later ones do not thus change, but are harder and darker in colour. Ulcerations heal up kindly with lotio sulph. cupri, or iodoform. unguent., the healing not being attended with any inconvenience to his general health. His bowels are regular; towards evening he invariably feels colder. At 12 noon, November 12, 1879, he had been standing in my presence in a breeze at an open window for fully an hour, when his temperature was taken,—mouth, 99·4° Fahr.; axilla, 100·2° Fahr.; pulse, 72. The larger tubercles only are devoid of

sensation. He is employed as a dresser in the Infirmary, and is a well-behaved, industrious inmate, obedient, cheerful, and resigned to his condition.

CASE IV.—*Confirmed Tuberculated Lepra, supposed to have been contracted by Vaccination.*

Joseph Francis C——, a fair Portuguese, born in Demerara, now aged 20 years. His parents are alive and healthy. He has been suffering for the last ten years from tuberculated lepra. He has a sister, aged 18 years, at present (1879) an inmate of the Asylum, suffering from the same form of leprosy. They were both admitted on July 30, 1877, from Murray Street, Georgetown. They have three sisters and one brother who are alive and well. Our patient, J. F. C., and his sister were vaccinated with lymph obtained from a member of a Portuguese family* in whom leprosy was afterwards found to exist. They were the only members of the C—— family vaccinated with this lymph. Within eighteen months of the performance of the operation by Dr.——, a reddish-brown spot appeared on the inner side of the right thigh, preceded, it is stated, by some constitutional disturbance; this spot was raised and tender, accompanied by profuse sweating all over the body, and remained for some time. Subsequently other spots made their appearance on the right buttock (which disappeared shortly after), between the shoulders, and on each cheek. They were all ushered in by more or less well-marked febrile symptoms. A red patch next appeared on the forehead, and epistaxis set in, periodically occurring to this day. Tubercles then made their appearance on the face, the other patches continuing to increase in thickness and roughness, and forming tubercular infiltration. The latter was removed by gurjun oil, under which treatment many of the symptoms were ameliorated.

State and Condition on November 30, 1879.—He has a light-brown irregular patch on the front of his chest; this had been

* It is within the knowledge of Dr. Manget, Surgeon-General, and the author, that this family are at present afflicted with tuberculated lepra.

larger, thicker, and mahogany-coloured, and has evidently undergone partial absorption. There is a patch of tubercular infiltration on the back of the arms, and at the bend of the elbows. The fingers are swollen, shining, and dark-looking, a solitary tubercle forming on the back of the hand. The swollen condition of the fingers and hands is very characteristic. There are two tubercles on each cheek, the size of large marbles; the lobes of the ears are thickened, and a tubercle is forming on the upper lip. There is no appearance of hair growing on the face. There are reddish-brown discolorations on the front and back of the legs. There are a few small scattered tubercles on the dorsum of the feet, and the lower part of the legs are swollen and hard to the touch. There are tubercles on the scrotum, an ulcer on the leg where a tubercle has ulcerated, and the larger tubercles are slightly anæsthetic. This young man is one of the carpenters of the Institution; he is in hopes the treatment now being adopted may yet arrest the disease, which is however, making slow but sure progress.

Case V.—*Advanced Hereditary Tuberculated Lepra.*

Gustavus Reginald L——, negro, aged 11 years, born in Barbadoes; diseased five years. His parents are dead; the mother had the same form of disease (T. L.). He was never vaccinated.

There are well-developed tubercles on the ears, cheeks, chin, alæ of nose, upper lip, and inside the nose. His eyebrows and eyelashes are thick with hair. There is an ill-defined discoloration on the back of the neck. The hair of the head is intact. Characteristic nasal breathing is present.

On the front of the chest and the abdomen there is the peculiar appearance of the skin seen in advanced cases of tuberculated lepra. I can only describe it as a *mottling*, dark and light circular shadings arranged symmetrically. There is no anæsthesia, and the dark part is the natural skin colour. On the back the lighter shading predominates, presenting somewhat the appearance as if mapping out the spinal cord.

The finger-nails are natural : four fingers are tumefied on their anterior aspect on the right hand, and there are tubercles on the little and ring fingers. There are dark shining tubercles on the right forearm, and a patch of psoriasis vulgaris about the elbows. A similar description would answer for the left upper extremity, the disease is not, however, so advanced. Both lower extremities are hypertrophied, the integument roughened, dark, and scabby. There are tubercles on the dorsum of both feet, the toes are tumefied, the nails perfect, and the soles sound. There is slight anæsthesia over the most developed tubercles. The glands in both groins below Poupart's ligament are enlarged ; there are tubercles on the front of each knee-joint, and others in various stages of development around the thighs, one standing prominently out on the right nates. He has scabies on both legs. The tubercles are tense, shining, and in some places very fresh looking, recent ones forming in circles around older ones. This lad has the peculiar lowering look imparted by the tuberculation to his face. The case is typical of hereditary T. L. in black natives of the West Indies.

Case VI.—*Tuberculated Lepra in a Female.*

Johanna R——, female, aged 42 years; six years a widow; her husband dropped dead in a police court. She is a fair Portuguese woman, born at Madeira, of healthy parents, and came to Demerara when a child. Two years ago (1877) she was treated by the author at Victoria village for syphilis. Her diet consists of fresh meat, vegetables, occasionally fish, salt and fresh. She has only one daughter, a girl of fifteen years, who is at present living with her mother, and is healthy.

The mother and daughter live in the same yard with another patient of mine, a boy, aged ten years, who has been suffering for some time past with well-marked tuberculated lepra.

J. R—— has been in bad health since she first contracted the venereal disease.

On the 3rd of June, 1879, she presented herself at my surgery, when the following was her state and condition :—

Her fingers were swollen, red, and shining, presenting a clubbed appearance ; they were painful to the touch. From the back of the right hand to the upper third of the arm there was a dark purplish looking infiltration, abruptly terminated by healthy skin, which, with the exception of a small patch near the elbow, has taken over the whole fore-arm. On the left side there is a similar state of things, but to a less degree, painful also to the touch (*hyperæsthesia*). These symptoms have been coming on gradually for a year, and were preceded by premonitory feverish symptoms, and erythematous patches on the latter situations, and on the cheeks, where was a characteristic shining puffiness, deeper in colour than the skin, evidently also commencing tubercular infiltration. She had running sores on the legs, but no anæsthesia in connection with them, and they were apparently unconnected with the leprous state. There was great mental despondency, loss of appetite, and sleeplessness. This case was one of incipient T. L., where infiltration had taken the place of the more ordinary tuberculation.

Case VII.—*Tubercular Infiltration.*

G. L——, a private patient, first came under observation on the 5th of May, 1879. A well-nourished Portuguese girl, aged 17 years ; parents are healthy. She has not yet menstruated, which it is common for females in this climate to, at twelve to fourteen years of age. Six months ago, not seeing the menses, she began to fear there was something wrong. She got fever at this time, and her face became puffy, which was attributed to constant wettings when at work at the farm, and the absent catamenia. During the last attack of fever some spots came out which were thought to be "mad-blood," the local name for urticaria ; they disappeared again, and did not attract much attention. Later on she began to speak through her nose, and to suffer from slight epistaxis, also attributed to the non-appearance of the menstrual flow. Matters becoming worse she sought advice.

I found well-marked tubercular infiltrations, as in the foregoing case, on the cheeks, lips, and chin, darker in colour than the natural sun-burnt Portuguese skin. There was a chocolate-coloured discoloration on the anterior parts of both forearms, and some light-brown pigmentary stains between the shoulders. These parts at first were painful to the touch, and at other times felt as if being stuck with pins or needles. Her fingers are partly bent from their swollen condition; but there is no anæsthesia anywhere.

As an instance of how difficult it is to get lepers to acknowledge other lepers as either friends or relations, this girl assured me she knew no one who was afflicted with leprosy or any other disease, yet, one day at the railway-station, I happened to meet G. L. in conversation with J. R., who came by the same train to consult me, and learnt they were intimate friends. This, of course, is only a coincidence, but in the Colonies these people live very much by, and among themselves. Several families may be found huddled together in one large house, subdivided into rooms communicating with each other merely by canvas screens, and, if a disease is capable of being propagated by contact, there is every possible opportunity afforded the healthy inmates of contracting the disease.

Some of the following Cases are illustrated by Plates, lithographed from drawings taken from life, or from photographs of patients at the Mahaica Leper Asylum :—

Case VIII.—*Typical of Hereditary Tuberculated Lepra in the Negro.*

(*See* Plate I.)

Thomas B——, aged 14 years; hereditary on father's side. The position, size, and appearance of the tuberculation may be seen on the ears, forehead, cheeks, nose, chin, arms, forearms, hands, legs, and thighs. The peculiar mottling was present on the abdomen and back. There were tubercles on the nates. The condition of the fingers is shown in the Plate, the nails being about to drop

off. The enlarged femoral glands are also delineated. He had been circumcised a few days previously, tuberculation of the prepuce having caused retention of urine. The disease commenced and progressed in the usual way.

CASE IX.—*Remarkable Case of Tuberculated Lepra of Six Years' standing.*

(*See* Plate II. Fig. 1.)

Asia T——, Barbadian lad, aged 22 years, an asylum patient. Parents are healthy. All his youth he had been in the habit of playing with two boys who were lepers. The first circumstance remembered in connection with the advent of the disease was the appearance of a red patch on the hip, accompanied with "pain all over the body." Subsequently he became tuberculated.

The face was covered with large masses arranged symmetrically. The glands in the groin were enlarged, and looked like two large tumours. There was loss of sensation in the facial masses. Nipples prominent. There were darkened stains on the thighs and abdomen, where erythematous patches had been. The hair had dropped out from the eyebrows. The skin over joints was cracked and fissured.

Fig. 2, Plate II., is from a photograph of an East Indian Coolie, named Ragoo, eight years diseased with tuberculated lepra.

CASE X.—*Tuberculated Lepra, showing the Appearance of the Face and Upper Extremities.*

(*See* Plate II. Fig. 3.)

Uriah J——, black boy, aged 13 years, native of British Guiana. His father is dead; mother alive, neither of them suffering from leprosy. His mother states he had fever off and on for about two months, when a spot appeared, followed by tubercles. As may be seen from the Plate, there were tubercles on the ears,—which stick out from the head,—on the alæ nasi,—widening and flattening this organ,—and on the chin and lips, the latter being everted in consequence. There was œdema, vesication, and commencing

tuberculation of the fingers and hands, particularly the little fingers, which were widely separated from the others. The condition of the arms and forearms is also shown. The nipples were enlarged and prominent, and there were enlarged glands in the groin. *There was no anæsthesia anywhere.*

After the photograph was taken the boy was lost sight of. He afterwards re-entered the asylum, and was sent to the infirmary with ulcerations on the legs. Whilst there he had several febrile exacerbations, attending a fresh outbreak of tubercles. His face increased in size, from swelling and tuberculation, and he now lies there, covered with ulcerations, and greatly debilitated.

Case XI.—*Tuberculated Lepra: probably Contagious.*

John H——, African, 42 years of age. Admitted on the 14th of June, 1878, from No. 1 Canal, Rio Demerary, where he suffered from remittent fever, and yaws. He got leprosy three years ago. His family are all healthy. At the Canal he lived with several lepers; he occupied one room with William Henry, a leper (no relation of his), and he cohabited there with a leper woman, named "Catharine." The disease appeared with the usual symptoms, but it was particularly noticed in this case that, after the feverish attack, the ears felt grainy, hot, and itchy. Afterwards tubercles made their appearance on the face, arms, forearms, and breasts (which are gradually becoming enlarged); then others followed on the back, legs, and feet. Those on the face are in clusters, in size from a pigeon's egg to a millet seed, the smaller ones clear as if containing serum, but they are solid; the larger ones only are slightly anæsthetic.

Case XII.—*Tuberculated Lepra: Enlargement of the Mammæ, and Loss of Sexual Appetite.*

(*See* Plate II. Fig. 4.)

George C——, mulatto, native of British Guiana, aged 27 years; now eight years diseased with tuberculated lepra. Parents

healthy. He was never vaccinated, and has had small-pox, measles, and syphilis, in the order named, before he got leprosy. Spots appeared on his body after some fever; these faded, and were followed by tubercles. The appearance of the face may be seen from the Plate; it has as much a feminine as a masculine look. The breasts enlarged gradually as the disease progressed; no hair grew on the face, and what came on the pubis afterwards fell out. He lost all virile power, the testicles having atrophied. Sores broke out on his legs, and tubercles formed on the forehead, ears, cheeks, lips, nose, mammæ, hands, back, and legs. The mammæ were enlarged as depicted. There were enlarged glands in the groin. His fingers and toes were tuberculated and ulcerated, and the feet and legs were œdematous.

CASE XIII.—*Tuberculated Lepra: showing the Appearance of the Face and Tongue.*

(*See* Plate III.)

Luke T——, African, aged 35 years. Now nine years diseased. He lived in the same house, at Pln. Providence, with two other Africans who had leprosy. The tubercles in this case are somewhat devoid of sensation; the nasal, croaking voice well marked. No family taint acknowledged. In January, 1880, he was in the infirmary with difficulty of deglutition owing to tubercles of the tongue, his state on admission having been thus noted:—"Tongue swollen, and denuded of epithelium at the edges. The organ presents two large irregular globular swellings on the dorsum, which are tense tubercular growths, scattered around which are smaller tubercles, one in course of ulceration." He was photographed after treatment by incisions, fomentations, &c., had been adopted. At this time the skin over the enlarged glands in the groin sloughed off, and revealed beneath a red, raw-looking gland enlarged to the size of a turkey's egg, which was surrounded by others of different sizes, having minute openings exuding ichorous matter. They all felt hard to the touch and movable; microscopical examina-

tion of a section did not reveal the leprous deposit as described by Hansen.

CASE XIV.—*Tuberculated Lepra: Tubercular Infiltration: Enlargement of the Glands in the Neck, and the Eruption occurring after Febrile Exacerbation.*

(*See* Plate IV.)

Pedro D. F——, aged 19 years, Portuguese lad, born in Demerara, of healthy parents. He lived with Antonio de P., at Leguan, when the author practised in that island. This Antonio de P. had a son who was then a leper, and he occupied one room with Pedro D. F. in an outhouse near Antonio's shop, where our patient was treated for large ulcers on both legs, a common tropical complaint.

About six years ago the patient noticed a spot on the anterior part of the right thigh, which was red and tender, and "he was laid up with fever from it." The next spots appeared on the feet and legs, and made him so ill that he had to seek admission into the Colonial Hospital, Georgetown.

Present State, 1879.—The hair is everywhere intact. He is covered with raised patches, darker and thicker on the cheeks, and the hands and arms are parts principally involved, the fingers being stiff and bent in consequence. The glands on the left side of the neck may be seen enlarged. They were poulticed and lanced, and discharged matter, which greatly relieved the face. The nails are dropping off from the fingers.

He was in the infirmary when the drawing was made, having just got over a febrile paroxysm. Over the front of the chest and abdomen may be seen purplish-red patches which came out during the fever; in many instances they were arranged in circles enclosing sound skin. It will be noticed how different an appearance this case presents to the ordinary tuberculated lepra, in which the abdomen and chest are generally free of tuberculation.

Similar patches were on the thighs and legs, but the back was free. The feet were becoming enlarged, and the glands in the groin were affected.

CASE XV. *is intended to Illustrate the Last Stages of Tuberculated Lepra.*

(*See* Plate V.)

Isaac J——, aged 47 years, an African, is nine and a half years diseased with pure tuberculated lepra. For the past nine months he has been an inmate of the Infirmary with extensive ulcerations on the upper and lower extremities, and cannot last long. There is no necrosis of bone, no deformity of joints; the ulcerative process is set in motion by a tubercle ulcerating.

The hypertrophy of the lower limbs that attends the last ravages of the disease is shown in the Plate, as also the ulcerations on the fingers, the nails having dropped off. The wasting of the upper extremities is in marked contrast to the condition of the lower ones.

6. *Complications and Modes of Termination of the Disease.*

I have tabulated a list of cases of tuberculated lepra that died at the General Leper Asylum during my tenure of office, in many of whom post-mortem examinations were made, and the following were the diseases which most frequently complicated the case, and caused a fatal termination :—

	Per cent.
1. Albuminous Nephritis	22½
2. Lung Complications, including Phthisis	17
3. Diarrhœa	10
4. Anæmia	5
5. Remittent Fever	5
6. Peritonitis	2½
7. Exhaustion from Leprous Ulcerations; or, Tubercular Obstruction of the Air Passages; or, Internal Leprous Deposits; Marasmus, Atrophy, in a word, the Effects of Leprosy	38
	100

1. From the above table it will be seen that albuminous nephritis caused 22½ per cent. of all deaths among tuberculated patients, this

disease being a fatal complication. The usual post-mortem appearances appertaining thereto are met with in leprosy, the kidneys not being specifically affected; nor does the urine of leper patients, as far as my examinations have gone, present anything abnormal or unusual, if we except the excessive secretion of urea during a febrile paroxysm, when the specific gravity has often been 1020. Albuminous nephritis is ushered in with feverishness, pain in the loins, and a sudden increase in the severity of the leprous symptoms; the face and lower extremities become œdematous; albumen appears in the urine, which later on may be found to contain blood corpuscles, and epithelial casts. This complication rapidly proves fatal; a few cases become chronic, but the respite is only a short one: once a leper enters the Infirmary with these symptoms he seldom leaves it again alive.

2. *Lung complications* caused 17 per cent. of all deaths in T. L. Next to phthisis, bronchitis and pneumonia are the most frequent. When the condition of the air passages in leprosy is taken into consideration, it is to be wondered at that more deaths are not attributable to inflammation of the air passages and lungs. The bronchitis is usually of a sub-acute character, and the pneumonia rapidly assumes a typhoid type. With regard to phthisis as a complication, it would be an interesting study how far, if at all, tuberculosis generally may be related to tuberculated lepra. May the one disease be, as it were, lit up by the other? I confess I am not in a position to discuss this matter, and I can only state that in the cases referred to in the table it is believed there was a pre-existing predisposition to phthisis, which was only developed on the system having been weakened by the effects of the other disease. The post-mortem appearances of some of the cases differed in no way from those met with in ordinary fatal cases of consumption, except that they were subjects with advanced tuberculated lepra.

3. *Diarrhœa* as a fatal complication comes next in the order of frequency. In T. L. it proceeds from a different cause to that operating in the case of non-tuberculated lepra. In the former

it may be caused by dampness, impure water, climatic changes, or disturbance of the digestive functions, and most frequently occurs during seasons of drought, when the supply of drinking water was not as wholesome as it should be. The intestinal ulcerations occasioning diarrhœal discharge in non-tuberculated lepra are not met with in T. L.

4. *Anæmia* caused 5 per cent. of all deaths in this form, the number of red corpuscles of the blood, as well as the quantity of fibrin, being diminished.* During the continuance of the anæmic condition the leprous disease progresses less rapidly, in some cases appears to be almost stationary, and the remaining tubercles dry up, nor have I observed the usual febrile exacerbations.

Luke T—— (Case XIII.), was under observation in the Infirmary with anæmia for some months. As long as this condition lasted, the leprous disease remained at a standstill; the anæmia having improved under the use of iron, the disease again commenced to progress. The same occurrences were noted in other cases.

5. *Remittent fever* as a complication may be easily understood, considering the climate; it does not, however, often prove fatal. This fever is different from the febrile exacerbations already described, and is readily controlled by the use of quinine, arsenic, &c.

6. *Peritonitis* is doubtless caused by the irritation of tuber-

* Dr. Scheida, from Bavaria, was engaged at Jamaica in researches on the infusoria; he examined the blood of several leper patients, and found a deficiency of red corpuscles. Danielssen and Boeck made eight analyses of the blood taken from patients with tuberculated lepra, in all of which the albumen and fibrin were increased. Hillairet, of St. Louis ("Ann. de Dermat. et Syphil.," tome v. No. 3, Paris), records the following analyses:—No. 1 was of blood taken from a European with T. L., five years' duration, where there was no fever. No. 2, from the same patient at the time the fever was beginning, but yet the amount of fibrin was not increased. No. 3, of blood taken from a middle-aged man, ten years diseased with T. L., the blood having been taken during the febrile stage, and with an eruption of tubercles. Hillairet states: "If the solid matters of the blood (albumen and albuminates) are often found in excess in leprosy, it is needful to remark that this occurs only under particular circumstances—that is to say, at the time of nodular outbreak accompanied by a febrile state, and caused by changes in the season, or in the same season by influences as yet but indifferently known." Carter (*loc. cit.*, p. 165), to whom I am indebted for a reference to the above in the first instance, states in this connection: "The essence of the morbid alterations of the blood consists in an excess of albumen and of fibrin, and the same changes are always found."

cles, which are sometimes, at the autopsies, found studding the mesentery.

7. The largest per-centage of deaths among my cases, amounting to 38 per cent., is stated to have been caused by exhaustion from leprosy, or the immediate consequences of the leprous disease itself.

The tendency of tuberculated lepra is to rapidly disorganize the blood, and to lead to a rapid decay of Nature. A more correct term might be "blood-poisoning from leprosy," for in some cases it seems to present the worst form of blood-poisoning I have ever seen.

It would be well if some general term were employed to designate the group of symptoms which are present at the closing scene of an uncomplicated case of leprosy. I have already stated that patients may be carried off during one of the paroxysms that attend a fresh deposition internally of leprous material, which has been by some likened to pyæmia; these cases may be said to die from the effects of leprosy. Or, death may ensue from obstruction of the windpipe, from tubercular growths, or thickening of the glottis, the patients dying from asphyxia, the direct result, also, of the leprous affection. There are, again, other cases in which leprosy induces a constitutional debility, either from the weakening effects of the large area of skin affected, or from chronic blood-poisoning. All writers on leprosy agree that the sufferer may die from the debility consequent on the progress of the malady, and the several names of hectic, marasmus, general debility, &c., have been used to describe this state or condition. The appetite fails, debility ensues, there is sleeplessness, the patient lies motionless, morose, indifferent, refuses food, and is only kept alive by a liberal supply of nourishment, stimulants, and anodynes which he has to be forced to take. The pulse becomes feeble, the heart's action fails, he literally fades away, poisoned by the exhalation from his sores, or the morbid matter carried into the circulation, which render the system unable to support life. In many instances, after death, amyloid degeneration, particularly of the liver and spleen, is found.

Deaths from exhaustion are more frequent at the change of

seasons, when a very long dry season is succeeded by a very wet one; this fact may be easily accounted for.

Some other complications attending tuberculated lepra require to be mentioned, although not proving fatal, among the most important of which are affections of the eye.* They may be occasioned by leprous deposits, or the actual growth of tubercles on the conjunctiva, sclerotic, cornea, or in the vicinity of the eye-ball. The conjunctiva in T. L. is nearly always in a state of congestion, but this form of conjunctivitis is to be distinguished from that which occurs in the non-tuberculated form, by the latter being associated with paralysis of the lower lid or ectropion, and is caused by irritation from without, as air, dust, &c. The cornea in many cases is the seat of tubercles, and opacity from interstitial keratitis not infrequently results, and, unless promptly treated, will lead to rapid destruction of the eye. A kind of pannus may be met with, and iritis has been known to occur. When it is remembered how the appendages of the eye are affected by the leprous growth, it will be apparent how great an influence their neighbourhood must have on the integrity of the eye, with its surrounding delicate structures. On taking charge of the Asylum I found seven lepers suffering from blindness, in addition to their other troubles.

Frequent mention has been made of scabies as a complication in tuberculated lepra, for nearly every case is associated with itch, caused by the common itch insect. This coexistence was first noticed by Danielssen and Boeck,† according to whom the face, hands, elbows, and feet were the parts principally affected. In my cases the face was rarely ever affected, the parts being the legs, around the waist where the buckle of the trousers would be, or around the loins where the coolie ties his bab-ba, or loin-cloth. In one series of my cases of T. L. 75 per cent. had scabies. Danielssen and Boeck state that the acari were found "in the lamellæ of the detached crusts," and consisted of "black horny masses" resembling the

* Leprous diseases of the eye have been elaborately treated by Drs. Bull and Hansen.

† *Loc. cit.*, pp. 215, 233; tap. xxi., xxiv.

"bark of a tree;" this complication would, therefore, seem to be as common in Northern Europe as in the tropical West Indies.

I must not omit alluding to an œdema of the scrotum that tubercular patients suffer from, which enlarges the parts to such an extent that the scrotum hangs down between the legs, but which should not be confounded with Elephantiasis Arabum, there being no connection whatever between these diseases.

Tuberculated lepra, in common with the other forms, may be associated with the following skin diseases:—Frambœsia, Psoriasis, Eczema, Herpes, Prurigo, Ecthyma, and Lichen.

In the neighbouring colony of Trinidad, according to Bakewell:* "In both forms of the disease, psoriasis, eczema, and other forms of skin disease are common, but not, I think, essential symptoms. Although nearly every patient at the Trinidad Leper Asylum had some eruption of the skin, I am inclined to think they were formed more by filth than anything else . . . . a squamous and ichthyotic condition is exceedingly common in tubercular cases."

I have often been struck with the fact of leprosy being so frequently preceded by small-pox, yaws, or syphilis. In my "Notes of 188 Cases of E. Græcorum,"† p. 4, it is stated, "134 of the 188 had never been vaccinated; of the latter number 65 had small-pox, 46 yaws, 15 both small-pox and yaws, 24 both small-pox and syphilis, and 7 syphilis and yaws, in the order named, before the leprous disease made its appearance."

7. *Mortality in Tuberculated Lepra.*

During the three years ending the 31st of December, 1879, 112 deaths were registered at the Asylum; 95 were males and 17 females. Thirty-eight males and four females suffered from tuberculated lepra. The average mortality to strength was nearly 20 per cent., or double that for nerve-lepra, which was only 10 per cent. In Trinidad the mortality in T. L. is given as 18 per cent.

* *Loc. cit.*, p. 23.

† Paper printed by the British Guiana Government, 1879.

8. *Influence of Sex.*

From returns which I have compiled, the male sex would appear to be more liable to this form. Thus, during the three years, 1877–80, 24 cases of T. L., out of a total of 115 admissions, were registered at the General Leper Asylum, comprising 17 males and 7 females. Among my private patients, out of 8 cases of this form under observation, 4 are boys, 2 girls, and 2 are women, but these cases are too few to draw any definite or satisfactory conclusion from; nevertheless, as far as my observations would lead me, I am inclined to the opinion that, in this part of the world, more males than females would be found suffering from the severer form, being apparently more liable to it. It is true that in the tropics males and male lepers generally preponderate, yet this excess of the male sex is not, to my mind, sufficient to account for the larger number met afflicted with T. L. in British Guiana and Trinidad for instance. Even in Norway, where the female sex is slightly in excess, the male appears to be there, also, more predisposed to this affection. Again, with reference to Jamaica, where, as regards the general population, the female sex is in excess, the leprous population is reported as 100 males to 99 females. In the Leper Asylum at Barbadoes, the population of which island is composed principally of negroes, more males than females will be found with tuberculated lepra, and this number would be still more increased if all the afflicted males presented themselves for admission; it is well known that large numbers endeavour to support themselves outside, until compelled by necessity, or the debility consequent on the extending ulcerations, to seek relief.

9. *Relative Frequency.*

Until within the last few years no records have been kept with reference to the form of leprosy prevalent in the Colony, nor has this subject received much attention at the hands of writers elsewhere, who have contented themselves with a general description; I am therefore reduced to the information, and statistics, derivable from patients

that were under treatment at the Asylum when I assumed charge, and those admitted since. Of the latter number, 20·86 per cent. were of the tuberculated form. Again, among 127 males at Mahaica in 1880, 22 per cent. were afflicted with T. L. Among the 188 cases, 18 per cent. were tuberculated, all these figures showing a close approximation. In Trinidad the per-centage is somewhat greater, and perhaps in some other parts of the West Indies, but it may be safely stated that, of all cases of West Indian leprosy, not more than 20 to 25 per cent. will be of this variety. Tubercular leprosy was well-marked in only 8 per cent. of Vandyke Carter's cases in India,* while in Norway they were greatly in excess of the other forms.

10. *Influence of Age.*

The average age on admission of the tuberculated cases was—

Males 27 years,

Females 29 years,

10 years younger than the non-tuberculated. It would follow that T. L. attacks the patient at an earlier age, and with regard to chronology, intermediate between the non- and the mixed-tuberculated varieties. If we allow the patients to have been diseased for one or two years prior to admission, this would leave the average age at which the disease appears somewhere between 20 and 25 years. The age will be invariably under 20 when the disease is hereditary.

The following table gives the ages on admission of these cases in decennial periods, taken from the Asylum Records, and compared with those from the Norway Asylum (Bergen), as compiled by Danielssen and Boeck :—

Age.	Birth to 10 years.	11 to 20 years.	21 to 30 years.	31 to 40 years.	41 to 50 years.	Over 50 years.
Leper Asylum, British Guiana.	12 per cent.	33 per cent.	12 per cent.	12 per cent.	20 per cent.	8 per cent.
Leper Asylum, Norway.	14 per cent.	33 per cent.	25 per cent.	17 per cent.	8 per cent.	No return.

* *Loc. cit.*, p. 54.

Forty-five per cent. of the admissions were thus under 20 years of age, as compared with 47 per cent. in the Norwegian cases.

The oldest male case I admitted was 60 years of age, and the youngest 8 years. The youngest case in which I have seen tuberculated lepra was in a boy 2½ years old, and he had the preliminary eruption some 10 months before I saw him. As a general rule, the youngest age at which T. L. may be seen fully-developed will be about 2 years in the case of male, and a little older in the case of female, children. Once only has a child born of leprous parents been seen with tubercles at birth.* Dr. Day has seen a child in arms with T. L. whose mother was affected.† Several children have been born at the Asylum, but their parents were not suffering from tuberculated lepra so often as the nerve-form. One, Jos. L——, had well-marked symptoms at 2 years of age; this boy's father had T. L., his mother nerve-lepra, and he has since developed the mixed variety. Another child did not become diseased till she was 3 years of age, her brother having well-marked tuberculation at 2 years; their parents are both diseased. Another member of this family, an infant 10 months old, has a peculiar scaly appearance of the skin which frequently foretells the advent of some form of leprosy.‡

11. *Hereditary Influence.*

Hereditariness§ is not so well-marked in tuberculated as in the mixed form. Among my admissions, whose histories I could rely on, their statements in many instances having been verified, the tuberculated cases had only 4 out of 24 with acknowledged here-

* "Leprosy Report, Royal College of Physicians," p. 70, No. 32, &c.

† "Leprosy Report," p. 102.

‡ Danielssen and Boeck have seen young children affected with tubercles whose parents stated that they had bluish spots at birth which subsequently became tuberculous.

In the "Leprosy Report," p. 64, par. 2, it is stated: "Occasionally, but very rarely, signs of the tuberculated form have been seen in the offspring of lepers, at or soon after birth." Dr. Saturnin (*loc. cit.*, p. 38), Med. Off. Leper Asylum, Trinidad, reports that a medical friend of his saw a case of T. L. in a male child at birth.

§ The subject of hereditariness in leprosy will be again alluded to, as I assume that hereditary influence in this disease is now generally acknowledged.

ditary taint, or 16·66 per cent. Mixed-tuberculated had 8 cases out of 20, or 40 per cent. Non-tuberculated had 9 cases out of 71, or 12·67 per cent.

Out of 38 other mixed cases, not included in the above, whose histories I investigated, 11 acknowledged hereditary taint, or a little over 33 per cent.

It would appear that hereditariness, or rather a hereditary predisposition, may be transmitted in T. L. both collaterally and direct; instances of this have come before me, and the opinions of other writers might be quoted in support thereof. It may suffice to bring forward one or two cases which came under my own personal observation. Maria B——, aged 43 years, lives on Plantation ——; her parents are said to have been affected, but she herself is free from leprous disease at present. Her family consist of the following children :*—

Abraham, aged 15 years, who has tuberculated lepra,
Samuel, „ 12 „ „ „
Lana (f.), „ 10 „ „ „
Caroline (f.) „ 9 „ „ „
David, jun. „ 7 „ „ „

and Jacob, an infant, aged 10 months, who has well-marked leprous cachexia.

One other example may be quoted :—J. W—— and G. W—— are twin brothers, negroes, aged 15 years. They have had tuberculated lepra for five years. Both had small-pox, and now there are tubercles, running sores, enlarged glands, hypertrophy, &c. Their mother died of the nodular form of leprosy.

12. *Influence of Race.*

The twenty-four tuberculated cases admitted were of the following races, viz. :—

* Condition of male parent or parents not ascertainable; the mother, when I examined her, had several suspicious symptoms, and I believe she will shortly become leprous. These children became diseased one after the other, and the affection in their case may be explainable on other hypotheses than that of inheritance.

Negroes	15
Coloured Creoles	1
East Indians	3
Portuguese	3
Chinese	2
	24

Thirty-four other cases of T. L., of which I have notes, were, with regard to race, classified thus :—

Negroes	19
Coloured Creoles	4
East Indians	4
Portuguese	5
Chinese	2
	34

Everywhere in the West Indies there is a preponderance, over all others, of black races affected with this form. It may be that, from their mode and manner of living, they are more exposed to predisposing influences; or, perhaps, they sooner, from destitution or other causes, seek admission into the asylums than, for instance, Portuguese, who are frequently afflicted, but do not care to enter an eleemosynary institution.

13. *Duration of Tuberculated Lepra.*

Tuberculated lepra is more rapid in its course than either the non- or the mixed-tuberculated variety. This is also the case in other countries where leprosy exists. In rare instances the disease may remain stationary for years, especially when placed under proper treatment, and the duration of the disease consequently prolonged. On the other hand, the patient may be carried off at any time by some complication such as we have just been considering. When hereditary, T. L. usually makes its appearance earlier in life, and its course is more rapidly fatal than when the patient is affected at a later age.

In India the duration is stated to be twelve years. In Norway, Danielssen and Boeck place it at eight to nine and a half years, and this closely approximates to the average duration in the West Indies. Among the inmates of the Asylum, who died of T. L. during the past four years, the average duration of the disease at death was—

Males, 9 years,
Females, 6 ,,

This would show that females are carried off earlier than males, the disease being more fatal to them. It is difficult, however, to arrive at a conclusion, on account of the frequency with which death is hastened by the intercurrent affection. The female sex, I should have stated, appear to be affected at a later age than males, and I gave the relative ages on admission in this form, as males, 27 years, and females, 29 years; the average duration at the time of admission being, for males, 4 years, and females, 3 years. This would leave 23 years, and 26 years, as the ages at which the disease first appeared. Now, the average ages at which my tuberculated cases died, was—

Males, 38 years,
Females, 32 ,,

the figures thus fairly approximating. The longest duration recorded in the case of males, was 20 years; the shortest, 1 year; and among females the longest duration was 9 years, and the shortest, 2 years. Kaposi* places the duration of tuberculated lepra at 8 to 9 years; in Ceylon, T. L. proves fatal within 8 to 10 years.

Referring to fatal cases occurring at St. George's Hospital, Bergen, 1840–47, Danielssen and Boeck† give the following results:—

Mean duration in subjects attacked with T. L.:—

Before the age of	15	years	.	.	.	.	.	9	years
Between	15	and	20	,,	.	.	.	.	.	11	,,
,,	20	,,	30	,,	.	.	.	.	.	$10\frac{1}{2}$	,,
,,	30	,,	40	,,	.	.	.	.	.	$9\frac{1}{6}$	,,

* Hebra, *loc. cit.*, p. 152.

† *Loc. cit.*, p. 330.

Between 40 and 50 years	8 years
„ 50 „ 60 „	$8\frac{3}{4}$ „

The mean duration of 77 fatal cases of T. L. being $9\frac{1}{2}$ years.

To preserve a uniformity of statistics for the purposes of comparison, I have compiled a similar table with reference to the British Guiana Asylum, from cases which proved fatal, 1876–80.

Mean duration in patients attacked with T. L.:—

Under 20 years	$8\frac{1}{2}$ years
Between 20 and 30 years	$5\frac{3}{8}$ „
„ 30 „ 40 „	$7\frac{1}{3}$ „
„ 40 „ 50 „	$10\frac{1}{7}$ „
„ 50 „ 60 „	$7\frac{3}{4}$ „
Over 60 years	13 „

the average duration of 38 fatal cases being $8\frac{3}{8}$ years. Taking only those cases under 30 would give a mean duration of the disease equal to 7 years, and cases between 30 and 50 years equal to 9 years. I think, therefore, sufficient grounds have been shown for the duration at which I have placed tuberculated lepra—viz., 8 to 9 years. It is worthy of note that in every country the duration is nearly the same—a point in favour of the classification adopted in this monograph, and for considering each form as a separate affection.

14. *Diagnosis.*

This is only difficult in the earlier stages of the disease; when once developed there should be no mistake in diagnosis. I have shown that the eruption is typical of the complaint, and that it is preceded by certain constant premonitory symptoms, subsequent ones being developed which leave no doubt as to the nature of the malady. When hereditary taint is known or suspected, this fact should place one on their guard, and on the look-out for the premonitory symptoms which may be expected to follow sooner or later.

Tuberculated lepra may have to be distinguished from syphilis, the early spot being said to resemble syphilitic roseola; but in

syphilis the patches are not raised; they are scaly, larger, of a different colour, and they never become less sensitive after a period of hyperæsthesia. In syphilitic tubercles a crust sometimes forms, which does not take place in leprosy; syphilitic tubercles are *pitted*, they have an areola, and are more or less copper-coloured. A single tubercle can hardly be distinguished from a syphilitic one, but in T. L. there is always infiltration present somewhere, in greater or less degree.

Acne rosacea, according to Kaposi,* is liable to be mistaken for T. L., and sarcoma pigmentosa, he writes, "bears a still greater resemblance to lepra tuberculosa than even lupus or syphilis;" in the latter, however, the face is not principally affected. I am indebted to the work of the late Tilbury Fox on "Diseases of the Skin" for the following description of the tubercles as they occur in syphilis, lupus, and leprosy:—

Tubercles in lupus are "soft, vascular in the mass, made up of immature cells. Cells tend to migrate widely and deeply; they undergo degeneration quickly. Tubercles are soft and vascular, and have a gelatinous aspect which is characteristic. They are reddish; they are covered by a few thin and adherent scales, and they do not discharge freely." They are also smaller, and with a serpiginous tendency.—*J. D. H.*

Tubercles in syphilis are "less vascular and paler. Cells more closely packed together. They lack the gelatinous aspect of the lupus ones. They occur in the scattered form; they discharge freely. Depressed centre of a syphilitic tubercle characteristic." They occupy a different site.—*J. D. H.*

Tubercles in leprosy "are more like those of lupus, being very rich in cells. They do not degenerate and soften up so rapidly as in the granulation tissue of lupus and syphilis. Their real seat is the deepest part of the true skin." They are more symmetrically disposed; they are more persistent, and do not occur on the scalp.—*J. D. H.*

* *Loc. cit.* p. 144.

The face is generally the part first affected in tuberculated lepra; the puffiness under the eyes and the thickening of the skin of the forehead will at once suggest the nature of the disease. A difficulty may arise in diagnosing a case of mixed-tuberculated lepra from advanced syphilis, the lesions in both being somewhat similar at first sight.

Tuberculated lepra, or Elephantiasis Græcorum, has nothing in common with Elephantiasis Arabum, in which the legs, feet, and scrotum are the parts that are implicated and enlarged in so remarkable a manner, *the face remaining unaffected.* In Elephantiasis Arabum, the knotted lymphatic glands, the velvety, dark-thickened fissured skin with "fungous suppuration," warty excrescences, and the constriction above the ankle, are very unlike the hypertrophied limbs of advanced T. L., in which the face is always tuberculated.

The eruption in T. L. may be distinguished from pityriasis versicolor by the branny scales of the latter, and by the microscope revealing the presence of fungous elements in pityriasis, which are not present in the tubercular affection. The difference between the two leprous eruptions (in T. L. and Nerve-lepra) will be considered in another chapter.

According to Carter,* "isolated tubercles rapidly growing might not be unlike acne," and "less active tubercles like molluscum."

Boeck states that the incipient tumefaction of the face is highly characteristic; in early cases a white person looks like a mulatto that is sun burnt. The colour of the leper spot is peculiar to it;† in no other disease are such patches succeeded by nodular formations, and this again will distinguish leprous from other tubercular affections.

15. *Prognosis.*

This is the most fatal form of leprosy, the prognosis, therefore,

* *Loc. cit.*, p. 69.

† A leper spot on the cheek of a Brazilian child was first diagnosed as nævus, and then pityriasis (Gibert, "Mal de la Peau," 1860).

is always grave, death terminating the patient's sufferings in comparatively few years. Risk to the patient does not seem to prevail in proportion, so much, to the quantity of deposit, as to the form of disease in which the latter manifests itself. Tubercular infiltration is much slower in its progress, is attended with less constitutional disturbance, and yields more readily to treatment. Tuberculated lepra must be classed, as yet, among the necessarily fatal diseases, not only on account of its inherent nature, or the effect of the attending complications, but also on account of the extensive amyloid degeneration consequent on the prolonged discharges.

Frequently succeeding exacerbations are a bad sign, showing the deeper implication of the system with leprous material. Much, however, may be done by judicious treatment to mitigate the severity of the symptoms, and to retard the fearful ravages of the disease, but, unless taken very early in hand, at best it is dreary and sad to contemplate the lot of the victim to this loathsome complaint.

Favourable symptoms are—shrinking up of the tubercles; long intermissions between the febrile attacks; the disease not implicating the air passages; and the absence of any extensive internal deposit, as evidenced by the fever being less severe, and with a lower temperature.

A large excretion of urea is evidence that the blood is loaded with the *materies morbi;* mental depression and exhaustion are unfavourable symptoms. The disease progresses steadily to a fatal termination, but, when uncomplicated, life may be prolonged past the usually assigned duration. In young patients and hereditary cases the termination may be expected earlier.

16. *Morbid Anatomy and Pathology.*

The pathology of this disease, according to Virchow, is the production and effusion into the fibro-cellular structures of a "new granulation tissue." The pathological difference between tuber-

culated and non-tuberculated lepra consists in the fact that the leprous deposit—which at present is believed to be identical in both forms—in the latter is effused in and around the nerve tissues, and hence, by the last named authority, termed "leprosy of the nerves."

The first accounts of autopsies, and the microscopical examination of leprous tissues, were published by Danielssen and Boeck in 1848,* and in 1862, in the "Samling af Jagttagelser om Hudens Sygdomne;" subsequently, examinations were made by Pruner, Simon, Virchow, Carter, Bergman, Hansen, Neumann, and Kaposi. To Carter belongs the credit of simultaneously verifying in India the conclusions and observations of the Norwegian authorities, and demonstrating the uniformity of the pathology of leprosy in the two countries.

With the exception of the heart, pancreas, the brain, and spinal cord, this neoplasma, or granulation tissue, may invade, in tuberculated lepra, the fibro-cellular coats and structures of all the organs, implicating the nerves sometimes secondarily, whereas in nerve-lepra (non-tuberculated) it will be seen that the latter are primarily affected.

The principal changes—all growths and deposits characteristic of T. L.—will be found in the true skin and mucous membrane. The appearance of the erythematous spot or patch, it has been explained, is the direct result of this leprous deposit, giving rise to a local congestion (Erasmus Wilson). The eruption is raised above the skin, and does not differ in its anatomical characters from ordinary tubercles. It is difficult to obtain for examination specimens of the early patch, but one said to have been about six weeks duration showed, with $\frac{1}{4}$-inch object, "characteristic reddish brown deposit irregularly studded through the substance, and arrayed in layers, cells with their nuclei being distinctly seen" (Carter).

The tubercles are cutaneous and subcutaneous, the former

* "Traité de la Spedalskhed," p. 229, pl. xxiii. figs. 5-6; pl. xxiv. figs. 7-8.

situated under the papillary layer, which is raised up by the deposit, the latter extending down to the subcutaneous cellular tissue. It is to R. Virchow we are indebted for a thorough knowledge of the microscopical anatomy of leprous tissue, which he has given us in his "Pathologie des Tumeurs," tome deuxième,* he having visited the leper asylums of Norway in the summer of 1859. At page 504, he states that he had examined tubercles taken from the living subject, and at the hospital of Rekna those tubercles that disfigured most were removed from the patients at their request. His collection included the skin from the face, hand, and fore-arm of an Egyptian leper. The examination gave constant results; the substance of the tubercle was composed of a granulation tissue, rich in cells. In the youngest of the little tumours, where the hair had not yet disappeared, the granulation tissue extended as far as the epidermis, as in lupus, and penetrated down to the subcutaneous cellular tissue.†

Viewed with a higher power, the new mass of tissue was found composed entirely of cells which are delineated in the work (Fig. A, 71 and B, p. 505), and which presented according to their development a varied form and size; further on he states: There is a continual production of small rounded cells between which the intercellular substance becomes gradually more scanty, so that between the cells, arranged in groups and rows, are seen only narrow glands of somewhat striped substance, which have a granular aspect and are rendered opaque by acetic acid.

* Translated from the German by Paul Aronssohn. Paris, 1869.

† "Habituellement elle ne forme pas une masse uniforme. Mais de grands faisceaux s'enchevetrant dans tous sens et présentant leur plus grand développement, leur point de départ, au voisinage des follicules pileux. Ces faisceaux, en partant de la peau, s'étendaient, comme dans les verrues charnues, d'une façon continue, jusque dans le tissu sous-cutané; on les reconnaissait déjà à l'œil nu par leur aspect anormal, plus transparent, brillant, d'un gris blanchâtre ou jaunâtre, qui les faisait beaucoup resembler aux verrues charnues. Les parties qui étaient restées normales entre elles se faisaient remarquer par une apparence jaune ou blanche. Les papilles n'étaient pas agrandies; au contraire, leur surface était plus unie. Des vaisseaux pénétraient dans la masse par sa base; cependant, ils étaient en assez petit nombre."

Virchow goes on to remark that on the whole his observations agreed with those of Danielssen and Boeck, previously made; although, considering how little advanced was the study of histology at that time, there existed no clearness either in the descriptions or explanations of these authors, but that their later researches (Iagttagelser, &c., 3rd livre, p. 11, tab. xiii. fig. 7) more nearly approached his own. Kobner had also obtained analogous results, and so had Carter in India. Simon's observations, with reference to a case of leprosy (Hautkrankheiten, 1851, p. 287, tab. iii. fig. 6a), entirely coincided with his (Virchow's). I will insert one more extract from this learned author (p. 506) :—

> As to the cells, I would again remark that, arrived at their highest degree of development, they represent round, pale elements, slightly granular, and easily destroyed; they often have a single nucleus of fair size, in which granules and nucleoli appear. With regard to the recent cells, I have been struck with one peculiarity—viz., their great tendency to vacuolation. Their size varies much. Some are no larger than the red corpuscles of the blood, the greater number equal in size ordinary lymph corpuscles, and some have the appearance of the largest mucous corpuscles.

It has been remarked by Piffard,* and other writers, that the small cell aggregation to be met with in early tuberculated lepra bear a close resemblance to the granulation tissue of lupus and syphilis, and this was particularly the case in some slides of lupus which the Curator of the College of Surgeons, Mr. Abraham, kindly permitted me to examine. In this connection Virchow remarks (p. 507) : It is evident that this production has a great analogy to that of lupus, inasmuch as in all its processes, its seat, duration, and slow development, it comes nearer to lupus than syphilis.

Although the large work of H. V. Carter bears date 1874, some years after G. A. Hansen published his important researches on leprosy, it should be mentioned that the former had published most of his discoveries in the "Trans. Med. and Phys. Soc. of Bombay," New Series, No. 8, in the year 1862 ; I shall, however, quote from

* *Loc. cit.*

"Leprosy and Elephantiasis," as containing later and more matured opinions. With reference to the microscopical examination of leper tissue Carter states (p. 89) :—

In the skin, disease is also limited to the dermoid and subjacent tissues, and it consists of the deposit of a plasma, in which granules and nuclei subsequently appear; the nerves, vessels, and appendages of the skin being necessarily implicated, thence result many of the symptoms previously described. This deposit is obviously of the same character as that found in the nerves, and the similarity forms, in my opinion, clear proof of the unity of leprosy, for the pathological changes are also the same in the eruption. Case 1, M. L. (Mixed Leprosy).—A section of skin of left cheek, which was reddened, thickened, coarse in aspect, rather lighter in colour (it is often darker) and somewhat shining. The entire substance of the skin is occupied by a reddish deposit, varying in thickness from $\frac{1}{8}$ to $\frac{1}{15}$ in., arranged in vertical patches, investing and compressing the sweat glands and hair follicles; an isolated patch of the granular and yellowish deposit may sometimes be seen in the subcutaneous tissue on the outside of a sweat gland. The sebaceous glands are distended, and appear to the eye as opaque white dots (they subsequently become atrophied and destroyed); the hairs are thin and scanty. The free surface of the cutis is slightly convex; papillæ not here seen (but readily in sounder skin around); the cuticle is little changed (often thinned and loaded with pigment); apertures of follicles and gland ducts enlarged. The new formation consists of a homogeneous material, rendered almost transparent by acetic acid, and disposed in layers, as would appear from the disposition of its nuclei and granular masses; these are of a yellowish tint, granular aspect, size and form irregular (sometimes large pigment cells are seen). In some cases distinct cells are visible with an indication of a nucleus, but in most no distinction of parts can be seen in the granular masses. In isolated places the deposit occupies the meshes of the areolar tissue, as if it had been effused there. Acetic acid renders these features more evident; ether only appears to make the presence of nuclei in the granular masses more apparent, but has otherwise little effect.

The observations of G. Armaeur Hansen, Assistant-Physician to the Leper Asylums, Bergen, Norway, were published in "Nordiskt Mediciniskt Arkiv," Band i. No. 13, 1869, at the end of which paper there are drawings of leper-cells as met with in the cutaneous nodule, the spleen and retina; and Band ii. Nos. 16 and 21, 1870, in which are some important plates: Plate I., with 16 figures (T. I., Bill. 1–16); Plate II., with 11 figures, (T. II., Bill. 1–11). The extracts I have made are principally from those published in 1870, and I have made use of the excellent translation by Carter given in his Appendix.*

* "Leprosy and Elephantiasis." Appendix A.

Whatever their seat, the formative elements of the tubercles are the same. If a preparation is taken from a young and still growing nodule recently extirpated, there will be seen chiefly round cells, the most part of the size of white-blood corpuscles; some with a distinct nucleus, others apparently without any; either quite clear or finely granular, and, when perfectly isolated, they may exhibit slight amœboid movements. Since the tubercles are well supplied with blood-vessels, these cells may possibly be derived from them. It is very rare to see a round cell with two nuclei. Here and there in the preparation may be found pale, clear, flat cells,* either spool-shaped or furnished with prolongations, and always presenting a distinct single nucleus. In a teased-out preparation may be seen, in addition, capillary vessels, sometimes dilated, and, as is apparent, at the torn extremities, manifestly composed of cells. The tubercle at this stage is firm, and the round cells are not very loose, but when a softer part is hit upon, the latter readily drop out, and they are now larger than white corpuscles, there form, too, becoming different; thus, some have a bulged contour, others are branched, others oval or spool-shaped. The flattened clear cells named above are also found, and some have multiple nuclei. Many cells have a granular centre or body, with clear branches; and sometimes are seen rather large cells, with or without prolongations, in which the nuclei are three—or four—parted.

The preceding accounts of the leprous elements embody the latest experiences of the most distinguished writers on leprosy, and I have not been sparing in my extracts from their works, for the purpose of comparing their results with those more recently arrived at with regard to West Indian leprosy. I have had examinations made, in the latest and most approved method, of tubercle extirpated from the living subject, as well as specially selected portions of leper tissue from various autopsies made in Demerara, and brought over in various preservative and hardening fluids.

One tubercle was from the face of Luke T——, an African (Case XIII. p. 37), who was nine years diseased with tuberculated lepra, and which I extirpated on the 8th July, 1881, the wound healing up within forty-eight hours. The following descriptions are by my friend Mr. P. S. Abraham, F.R.C.S.I., Curator of the Royal College of Surgeons' Museum, Ireland. They were made specially for this work, and contain a more complete description of the tubercle proper than has hitherto been laid before the profession. It will be seen that Mr. Abraham describes giant cells in my specimens, very similar to those figured in Hansen's papers referred to.

* Page 3 of Hansen's paper. These are figured in T. I., Bill. 4.

*Description of a Microscopical Section taken from a small "Tubercle" from the Face of Luke T——.**

The so-called "tubercle" is seen as a condensed cellular mass, occupying a portion of the corium, slightly pushing out the thinned epidermic layer above it, and passing gradually into the tissue below and around, with but little definite demarcation, except perhaps at the sides, when occasionally fibrous bands to some extent mark it off.

Under a low power, the *epidermis* in the whole section is thin, with but few and irregular interpapillary processes. Over the protrudent mass it thins rapidly, into almost a single layer of large, irregular, scantily pigmented cells, probably the remnant of the *rete Malpighii* which has been pushed up. The corium in the neighbourhood of the "tubercle" is well developed, and contains, in addition to its normal elements, masses of cells, which seem to be situated, in many places, in close connection with somewhat altered blood-vessels and sweat-glands. Bands of fibrous tissue freely interlace and enclose these cellular collections—of which some appear to be off-sets from, or in connection with, the large mass which constitutes the "tubercle" itself. In the latter, no hair-follicles, glands, or ducts, are to be seen; but, in the immediate neighbourhood, the hairs are numerous, and their follicles are particularly remarkable for the enormous development of the sebaceous glands. Not only are the latter generally enlarged, but there is evident hyperplasia, and increased size of the secreting cells. The sudoriparous glands, of which two are seen in one of the sections under observation, are, on the contrary, apparently in process of atrophy, broken up, and much encumbered with a darkly stained small-celled growth.

Under this low power, the only definite structure to be made out

* The microscopical examination was made by the help of Crouch's ½in. and ⅛in. object-glasses and a Hartnack's No. 8; therefore under magnifying powers of from — to 600 diameters. The preparation had been hardened and preserved in "high wines" (sugar spirit), then in methylated spirit, and finally in absolute alcohol. The staining was effected by hæmatoxylin dye, according to the method recommended by Dr. Klein: some of the sections were, in addition, double-stained with picro-carmine. I desire in this place to acknowledge the kind assistance and advice which I received from Dr. Klein, who was good enough to examine the preparations.—P. S. A.

in the substance of the "tubercle" are (1) small cells, some of which, more darkly stained, are massed in groups, and (2) situated more especially in the deeper and peripheral parts of the growth, larger, multinucleated cells, occupying spaces in the granulation matrix.

Under examination by higher powers, the epidermis over the "tubercle" is seen to consist of cells, evidently belonging to the deeper part of Malpighian layer, which have somewhat lost the columnar shape, and have become more flattened, sometimes irregular in shape, and, in general, less pigmented than the homologous cells of the surrounding epidermis. The latter—viz., the epidermis of the surrounding skin—shows the interpapillary processes almost obsolete, or but irregularly developed; and in the sub-epidermic layer of the corium are to be seen scattered, irregular, and branched pigmented migratory corpuscles. A further sprinkling of dark brown granules, often in groups, is to be made out in the same tissue. Some of the cells of the middle layer of the epidermis show their prickle-processes. The layer of connective tissue in the skin near the "tubercle" is fibrous in character, with mostly horizontal arrangement of the elements. The corpuscles are compressed or laterally elongated, and occasionally show some pigmentation. In addition, there can be made out in places, but with some difficulty, apparently granular masses of faint contour. Collections of cells with darkly-stained nuclei here become apparent, and some of the vessels show proliferation of their cellular elements. Passing gradually into a deeper layer, we find the general structure considerably more cellular, the cells varying much in size, shape, and probably nature. Some are like the cells of granulation tissue, with large darkly-stained nuclei occupying the bulk of the cell substance; others are larger, with irregular outline, and with more abundant protoplasmic substance around the nucleus. Further, belonging to the arterioles, are to be seen the elongated nuclei of unstriped muscle fibres, as well as the nuclei of endothelial elements. As we go deeper into the tissue which passes into the periphery and depth

of the "tubercle," the more characteristic elements of the latter become by degrees prominent.

The hair follicles which dip into this part of this skin are large, and mostly of wide calibre towards their mouths, when considered in relation to the slender contained hairs. The lining epithelium of the follicle appears to be greatly developed, and the orifices of the sebaceous glands very wide. The hair itself is in most cases delicate, and but slightly pigmented. The cells of the sebaceous glands are larger than any I have before observed, and the protoplasmic network of the cell substance, and of the nucleus of these cells, is very distinctly shown.

Some of the sudoriparous glands—viz., those far away—do not seem to be much affected, but those near the region of the tubercle are so encroached upon and smothered in the inflammatory-looking cell growth, that only fragments of gland tissue appear to be in some cases remaining. The connective tissue, indeed, in and around the sweat glands, seems to be one of the starting-points for the new growth. No elongation of the whole gland is perceivable in these specimens, such as has been described. In the "tubercle" itself, the cellular mass, in the middle, almost comes up to the thin layer of epidermis, only a thin layer of horizontal fibrous tissue intervening. The cells of the superficial part are most irregular in form and size, and in their amount of staining. Even here some have taken on a large size, and have become polynucleated; and the cell substance of some has a slightly yellowish brown or dusky hue. The nuclei are extremely various; sometimes they exhibit the protoplasmic network, and they may be with or without nucleoli. Interspersed throughout this part of the growth are horizontally-elongated cells, which soon so much increase in proceeding into the depth, that they form a layer, much broken up, however, and with the bundles separated, by irregularly-shaped large and small cells which have a granular appearance, one or more nuclei, and which do not differ materially from some of the other cells just mentioned.

Most of the remaining mass of the growth is made up of small cells, of others of irregular size and shape, and of giant-cells (Plate XXI. fig. A, *b*)—the general matrix being fibrous and scanty, except in the peripheral portions and in the lower part of the mass.

Of the small cells, some have large, round, darkly-stained nuclei—and these are often agglomerated; others have oval, elongated, or irregularly-formed nuclei; and the cell substance of some has the irregular shape of connective tissue corpuscles. In addition, there are larger cells scattered everywhere, with nuclei less darkly-stained and with cell-substance more abundant in proportion. Many of these are of irregular form, and some begin to show fatty deposition and vacuolation (Fig. A, *a*); in others, the development of additional nuclei is apparently in progress. In this manner there seems to be in most parts of the mass a gradual passage from these cells into the large giant cells, which, however, are larger, more distinct, and more numerous in the lowest and most marginal portions of the growth. Here also their vacuolation and fatty degeneration is much more marked (Fig. A, *b*). As indicated above, the connective tissue corpuscles themselves seem to be taking on an increased growth, but in other cases the giant-cell appears to be springing from the living epithelioid membrane of small vessels or lymph spaces. Many of them occupy spaces or meshes of (Fig. A, *c*) a surrounding connective tissue matrix (A, *d*), and sometimes the wall of the space at some part or other is very distinct (A, *c*). Occasionally two giant cells are closely appressed together, giving the idea of their origin from fission of a parent cell. The different appearances, in fact, point to the probability of their formation in more than one way.

The following is a report on a tubercle excised from the ear of an inmate of the General Leper Asylum. Wm. F——, an African, six years diseased with pure tuberculated lepra, admitted by me, Oct. 10, 1879. The specimen was of recent growth; other tubercles on the same patient are noted as having become shrivelled up or ulcerated, leaving characteristic sclerous patches behind.

*Description of Section taken from a "Tubercle" excised from the Ear of a Patient with Leprosy.**

The cells of the epidermis show some hypertrophy, and much pigmentary deposit in all layers (Fig. B, *a*). The interpapillary processes are everywhere irregular, and in parts over the growth quite obsolete. The subjoining layer of corium is much studded with irregularly-shaped, brown-pigmented migratory cells (Fig. B, *b*); and faint irregular granular masses are distinguishable in some parts (Fig. B, *c*).

Some of the normal connective-tissue cells of this region are much flattened and spindle-shaped.

In one spot an irregular lacunar space, probably lymphatic, is visible with a dark granular material within and adherent to the wall (Fig. B, *d*).

The rest of the growth is made up principally of a dense collection of cells, mostly irregular in shape and size, with nuclei distinct, and sometimes showing one or more nucleolar points. Some of the cells have more than one nucleus, but none of them have assumed the size or number of nuclei of giant-cells, except in one or two doubtful cases. Although the bulk of the new growth is thus constituted, a considerable amount of fatty development has taken place—especially at a deep level and at the sides, where, singly and in clusters, large, round or oval fat-cells, in different stages of growth, are frequent. In some of the fat-cells are radiate clusters of fine crystals (? fatty acid). An intercellular matrix, fibrillar, or sometimes apparently granular, also comes into view in the loose peripheral parts. In the denser parts of the mass no vessels are evident, but, in the looser structure below, an artery of some size comes into view. As it proceeds into the mass its walls become more and more altered, and its lumen more narrowed and finally lost. The change in the artery consists in a thickening of all the coats, and in the presence throughout its section of large, irregular

* The preparation arrived from Demerara in a mixture of spirit and dilute chromic acid.

cells, which can be referred neither to the unstriped muscle of the middle coat nor to the endothelial cells of the interior. They seem to be most numerous in the middle coat and deeper portions of the outer (Fig. C).

Hairs and hair-follicles are not numerous in this preparation, and there seems to be some evidence of degeneration in one or two of them. In one case, a hair *in situ* has, in its extruded portion, an irregular and abnormally scaly contour, and its pigment is unsymmetrically and sparsely deposited; in another, there is some apparent fatty degeneration within the follicle; and in a third, that process has proceeded so far in the adjoining sebaceous gland that the proper glandular structure is largely destroyed.

The sudoriparous glands have nearly all disappeared; in one of the sections only the remains of an altered gland are left, showing general atrophy, breaking up, and epithelial degeneration.

The next Report refers to a tubercle which I excised from the prepuce of Case X. p. 35. (See Plate II. Fig. 3.)

Description of Section taken from Prepucial "Tubercle" of Uriah I——.

The epidermic layer is unhealthy, and irregular, with many of the cells granular and hypertrophied, and freely encroaching into the sub-epidermic tissue. In some places large typical epithelial nests have formed in the deep part of the epidermis; and there is also evidence of cylindrical masses of slightly altered epidermic cells, extending deeply into the substance of the growth. The latter is composed in the main of fibrous tissue, with the cellular elements largely preponderating. The form, size, and character of the cells is very variable, and in many places they are massed together, having evidently been formed around and in the walls of vessels (Fig. D). In some parts the arteries, as they enter the growth, are seen to become thick in their walls by an interstitial cellular development. The cells chiefly occupy the middle and adventitious coats, expanding

them out, often unsymmetrically, to an enormous extent. In shape and size the cells are irregular, and they are granular in appearance; and, to be seen among them, are occasionally masses of dark granules. The lumen of the artery becomes more and more flattened and constricted, and ultimately lost. Sometimes two neighbouring vessels seem to coalesce; and, in this way, no doubt, a great part of the substance of the growth is formed.

In a section taken from a prepucial growth of Felix,* very much the same appearances are presented; but the encroachment of epidermis into the substance, and development of epithelial nests do not exist. Further points of difference are, that the cell infiltration of the arterial coats, although just as extensive, is at first confined to the adventilia; and that several well-formed giant-cells, and some fat cells, are scattered throughout the mass of the growth.

The changes in the skin differ, but in degree only, with the progress of the case. As the patch or tubercle advances, becoming thicker, raised, and darker in colour, the deposit will be found to occupy a larger area, investing still further the nerves, and, in my opinion, by mechanical pressure on them giving rise to a certain degree of anæsthesia, as we know occurs in some tumours, aneurisms, &c. Similar pathological changes in the nerves, such as will be described under the non-tuberculated form, have not yet been found in cases of pure tuberculated lepra; in the solitary case of Carter's, in which specific disease of the nerves was said to have been present, no details are given of the exact microscopical characters of the parts involved. I have examined many cases of T. L., both in hospital and mortuary, but could find no trace of the nerve disease found in the non-tuberculated lepra, nor are any signs and symptoms of the nerves being affected present during life. Danielssen and Boeck, in their earlier work, were inclined to draw

* A lad, about the same age as Uriah I——, and same time diseased with Tuberculated Lepra, on whom I performed circumcision.

some distinction between the nerves in T. L. "compressed," as in tumours, &c., and the condition analogous to neuritis, where there are pain, swelling, &c., symptoms altogether absent in T. L. The enlargement and hypertrophy of the sebaceous glands so well seen in Plate XXI. is a marked feature of the disease, and explains the oily, greasy condition of the parts which has been described as resulting from their hyperaction.

Besides the skin, the mucous membrane of the nose, fauces, larynx, hard palate, and tongue, the trachea, and large bronchi, have been found after death studded with various-sized tubercles. They sufficiently account for the difficulty of breathing, hoarseness, or croaking, so common in advanced T. L. ; and when they ulcerate, as they frequently do, the peculiar breath-fetor, so characteristic of lepers, results, as well as the other serious constitutional disturbances. One of my patients, a Chinese, named Chan a Fook, was admitted into the Infirmary with obstruction of his breathing from tuberculation. He died on the 24th of December, 1879, and on examination the glottis was found almost closed with tubercular thickening.

Adverting now to the internal organs, I have made *post mortem* examinations in the case of two tuberculated lepers who died, one with bronchitis, and the other phthisis, but in neither were the substance of the lung found to be affected with leprous deposit. All the authorities agree in stating that the lungs are not affected in leprosy, but that tubercles may sometimes be met with in the pleura. Amyloid degeneration will frequently be found in these cases after death, particularly of the liver, spleen, and kidneys, no doubt in consequence of exhausting discharges from the extensive ulcerations. I have been struck with the infrequency of jaundice among lepers, and Carter states (p. 78) that the liver in these cases is "almost invariably healthy." One liver that I examined, at a *post mortem* on J. S——, seven years diseased with tuberculated lepra, white patches were seen on its convex surface, attributed by me to the attack of peri-hepatitis from which

the man had suffered. A section of this liver has been examined by Mr. Abraham microscopically, with the following results :—

The section of liver presents externally a nutmeg appearance, and a few white patches where the capsule is thickened. Sections were taken through some of them, including also a portion of the adjacent liver substance. The principal changes in the latter consist in a considerable development of a small-celled irregular growth, particularly in the neighbourhood of the septal prolongations of Glisson's capsule, and in the occurrence of brownish granular masses, sometimes in the substance of the liver-cells, and sometimes between them. The latter have occasionally an abnormally granular appearance, or show other evidence of degeneration. The thickened capsule is studded in its deeper layers with a more or less copious deposit of the same small irregular cells, and between its fibres are also to be seen elongated granular masses of a brownish tint ; in some places also many nucleated giant cells are occupying spaces within it.

The spleen I have met enlarged, soft, pliable, and weighing as much as 10 lbs. The mesentery I have found studded with tubercles. When dealing with the complications, reference was made to albuminous nephritis in tuberculated cases, and I have notes of ten cases in which fatty degeneration of the kidney was present.*

With regard to the organs of generation, the prepuce and scrotum are frequently the seat of tubercles, and atrophy of the testes takes place when the disease commences at or before puberty, coincident sometimes with the enlargement of the mammæ referred to. One of these atrophied testes, from the last case, J. S——, with many other specimens illustrative of the pathology of both forms of leprosy, has been presented by me to the Museum of the Royal College of Surgeons in Ireland, and a section through it, Mr. Abraham reports, shows very similar alterations to that of

* Danielssen and Boeck report having met with kidneys "congested, enlarged, with a white or yellowish deposit in the tubular portion," but Carter states that no true leprous disease of the kidney is yet known.

the liver, with a copious intertubular small-celled growth, occasional small and indistinct granular masses, and very great degenerative changes in the secreting cells, which are enlarged, granular in texture, with indefinite outline, and which often entirely fill up the lumen of the tubule. Hansen detected, at a *post mortem* made at Bergen, 23rd September, 1873, leprous elements in the seminiferous tubes of a young leper who died there, and other Norwegian writers have found tubercles on the peritoneal covering of the ovaries.

The lymphatic glands in T. L. are found enlarged in the earliest stages of the disease, before sufficient irritation is present to affect this enlargement; irritation from neighbouring tubercles, it is commonly known, is a frequent cause later on in the affection. A great deal has been written on the lymphatics in leprosy, and a variety of opinions prevail. Carter writes :*—"The lymphatic vessels and glands were not affected in any special way as far as examined. In one case complicated with syphilis the opaque cortex of the enlarged inguinal glands contained large granular cells or masses which bore a close resemblance to those found in the thickened leprous skin." Kaposi† states :—"There is nothing very characteristic about the lymphatic glands." Danielssen and Boeck are of opinion that the enlargement is a sort of "glandular hypertrophy;" but Hansen‡ found specific leprous elements in the external glands as well as in those situated in the porta hepatis and hilus of the spleen ; and in answer to the question, "Have the elements in the glands the same properties as those in the skin ?" he answers, "It might be so inferred from their entire anatomical correspondence." To come nearer home, I have been favoured by Dr. Hoggan, of London, with a small pamphlet on "The Lymphatics in Leprosy," reprinted from the "Transactions of the Pathological Society," 1879. The Paper

* *Loc. cit.*, p. 80. See also "Trans. Path. Soc. London," vol. xxvii. 1876, p. 297, where micrococcus masses were said to have been found in the lymphatics, more fully dealt with in the chapter on Etiology.

† *Loc. cit.*, p. 178. ‡ "Nord. Med. Arkiv," Band ii. No. 16, 1870.

refers to the lymphatics of the skin in leprosy, and appears to have been written with a view of correcting the opinions advanced by Dr. Carter in the 27th vol. of the Transactions referred to below. Dr. Hoggan states (p. 7):—"Finally, as the result of my investigations into the lymphatic and other systems in leprosy, I feel bound to state that, although leprosy causes changes in the appearance of the lymphatics, these changes are merely secondary, and the lymphatics themselves have no share in the causation of the disease, which must be sought for in other tissues."

At the Clinical Society of London, October 10th, 1879, a report of a case of leprosy was brought forward by Dr. Douglas Powell (*Lancet,* Oct. 18th, 1879). A committee of observation had been appointed, consisting of Drs. Powell, Cayley, Dyce-Duckworth, and Liveing. The case was one of mixed tuberculated lepra, and at the *post mortem* examination "fibroid induration of the glands" was found. In reply to Dr. Fox, Dr. Powell stated that he had not noticed the "aggregation of cells" described by Hansen.

CHAPTER II.

Non-Tuberculated Lepra.

Synon.—Anæsthetic Leprosy (*J. Robinson*). Lepra Nervosa (*Carter*). E. Glabra (*Boeck*). Leuke (*Greeks*). Baras (*Arabians*). Vitiligo (*Celsus*). Joint-evil (*West Indians*). Sunbahirii (*Hindoos*). Lepra Mutilans. Dry Leprosy.

It is characterized by a diseased condition of the nerves, the result of a deposit of neoplasma in and outside their structures, and has an eruption pathognomonic of it.

This is essentially a *nerve disease*, in which loss of sensation is a prominent feature, and was from this cause first called anæsthetic leprosy.

1. *General Symptoms and Description.—Prodromata.*

Prodromata. — These are different from the prodromata experienced in tuberculated lepra, in which a premonitory fever precedes the eruption, but in this form, also, several precursory symptoms precede the appearance of the disease, indicative of local nerve-disorder. Patients complain of pain and tenderness in various parts of the body, attributed to approaching rheumatism; tenderness of the skin generally;* shooting, lancinating, or darting pains along the course of certain nerves, rendered worse by pressure, and giving rise to shocks as if from electricity. This is particularly the case with regard to the median, ulnar, peroneal, and some others. Sometimes a burning feeling along the nerve is complained of; in addition, the patient will feel out of sorts, and may suffer from gastric and circulatory disturbances, whilst in other instances a numb feeling is experienced from elbow to fingers. In hereditary cases there may be a leprous cachexia developed, the

* Boeck refers in his work to the extreme sensitiveness of the skin.

symptoms, however, not pointing to any particular form of the disease.

The great drowsiness complained of in the early stages of T. L. is conspicuously absent, the latter symptom being as pathognomonic of T. L. as the lancinating nerve pain is of the non-tuberculated variety. Nearly all the cases that have come under my observation have attributed these pains to rheumatism or neuralgia. There is often also a feeling of chilliness, thought to be commencing ague. Another early symptom, present before the eruption has appeared, is that the patient finds he cannot grasp things so readily, or he lets them constantly slip from his hands. The field labourer has a difficulty in retaining hold of his cutlass,* not so much from loss of sensation in the parts, as a want of co-ordinating power or muscular weakness, which, in some cases, amounts to a general tremor or shaking of the limbs—a most distressing symptom. These shooting pains, or an undue sensitiveness, are nearly always felt in the fingers or toes before these parts are affected. Bullæ† form on the extremities of the latter, the result of disturbed nerve influence, but, it should be mentioned, they occur both early and late in the course of this disease; the early bullæ are small and numerous, the later ones large and solitary. They are like the blisters caused by a burn or scald, and when they burst the skin desquamates, and a sore results, but ultimately the parts dry up. Kaposi refers to an outbreak of blebs as a prodromal symptom, "representing a sort of pemphigus,"‡ which he distinguishes from idiopathic pemphigus by the leprous bullæ being single, and new ones only appearing after the old ones have become healed—a description more applicable to those of a later formation.

In one of my cases, in addition to the rheumatic-like pain, another symptom, also present long before the eruption, was wasting of the

* Principal agricultural instrument of the negro.

† Boeck was the first to draw attention to this prodromata, which he designated "Pemphigus Solitarius" (*Norsk Mag. for Laegevid.*, 1842, p. 149).

‡ Hebra, *loc. cit.*, p. 138.

muscles of the affected forearm, the little finger being somewhat contracted, and stretched out with difficulty. This finger, it will be seen, is invariably the first one to suffer, and the ulnar the first nerve.

These prodromata* may last for as many as twelve months, and will be followed by outward manifestations, in the first instance in the form of an eruption of spots or blotches.

For practical purposes three stages may be arranged in the course of this eruption—viz., (1) Preliminary, (2) Spreading, and (3) Permanent stage, in connection with which the signs and symptoms of non-tuberculated lepra will be better described and understood. The stages are by no means arbitrary, the eruption not running a fixed course, and nearly every case differs in some particular as regards time of appearance and duration of any set of symptoms; they are merely adopted for the sake of convenience.

(*a*) *Preliminary Stage.*

In this stage the spots may be said to be first noticed on the patient. They appear singly, as a rule, on places of selection, and of moderate size, an inch to two inches in diameter; they may be of various forms, the circular, however, predominating. In the first instance they are not anæsthetic; they may feel itchy, or even said to burn when rubbed with the finger for any length of time, but there is not the hyperæsthesia of the tuberculated spot. In all

* Danielssen in his monograph, published in 1862 (p. 1), states, with reference to the disease in Norway: "The anæsthetic form, which always maintains a chronic course, commonly does not develop itself until after a series of general symptoms or precursory signs have taken place;" and then he enumerates some of them as "chills and flushes," "coldness," "oppression," "sharp pains like rheumatism," &c. Reference is also made to drowsiness in connection with non-tuberculated lepra, but this, I think, must have been an error.

In Dr. Gavin Milroy's "Report on Leprosy and Yaws," Dr. Bowerbank, of Jamaica, states (p. 37): "The first symptom here (*i.e.*, A. L.) may be said to be shooting pains like electric shocks along the course of the nerves leading to the hand and foot; a sensation of intense burning in the course of the nerves of a toe or finger; a perceptible wasting of the muscles of the hand and foot."

cases the spots are pretty well defined, but not raised above the surface. In fair races they are of a light yellow colour, or they may consist of merely pale discolorations of the skin, whilst in black races they are almost invariably a bright yellow.

The most frequent sites of the eruption—more fully considered elsewhere—are on the back, the shoulders, the posterior parts of the arms, the nates, thighs, and around the knees, around the elbows, and on the face.

Although in some cases it would appear as if the patch corresponded to the distribution of a nerve, such is not always the case. I have, however, been struck with how frequently the course of the musculo-spiral is apparently taken by this eruption.

The point to which it is particularly desired to direct attention is the presence of nerve-disease prior to the preliminary eruptive stage, one not hitherto made sufficiently clear. In several cases that came under observation, evidence of nerve-disease was found to exist either in the forearm or leg sometime before the spots made their appearance. During this stage of the eruption we find the patient does not suffer much in general health ; the nerve-affection will progress, and patches of eruption, without any premonitory or other fever, continue to appear, commencing contraction of the little or ring finger, and the formation of small bullæ being a frequent sign of the disease at this time.

It may be stated, then, that in the first stage there will be—(1) prodromata, (2) appearance of the eruption, and (3) commencing atrophy. The preliminary stage may last from one to two years, the spots in the first instance being always level with the skin. In a very few cases they may be anæsthetic, but generally this symptom is not present until the patches commence to enlarge, or about the second stage of the disease. From their earliest appearance the secretion of sweat in the patches is first arrested, to be subsequently followed by complete suspension, owing to atrophy or destruction of the sweat glands.

Loss of tactile power is an early sign ; in fact, early and late, all

the symptoms point to, and are what may be expected to arise from, impairment of nerve influence. There are, moreover, different degrees of muscular loss of power. In the first stage it is present only as a temporary tremor or weakness, inability to hold things firmly in the hand; then follows loss of feeling in the parts, and, by-and-by, in the third stage, complete paralysis will supervene.

The following cases are intended to illustrate some of the foregoing statements:—

CASE XVI.—*Illustrative of the Preliminary Stage of Non-tuberculated Lepra.*

Alice Vernon M—— (Asylum inmate), aged 12 years, a coloured girl, born at Demerara. Father is dead, cause of death not known; mother has non-tuberculated lepra. Two years ago, then ten years of age, she was attending school; she suffered in her general health, and from "flying pains" in the right arm and forearm, with numbness of the right little finger, which became bent and stiffened. Six months after these symptoms a spot appeared on the right thigh, followed by others.

Present State: Duration of Disease Two Years.—There are several copper-coloured spots, in size from a shilling to a saucer, on the front and back of both thighs and legs. The right little finger is smaller than the other, and firmly contracted. On the outside of this forearm a light copper-coloured spot has just made its appearance level with the skin, and not anæsthetic. The other patches are slightly benumbed in their centres, there is loss of sensibility in the contracted finger, and the ulnar nerve is anæsthetic in part of its course, and painful on pressure, but no actual enlargement can be made out.

CASE XVII.—*Illustrative of the Preliminary Stage of Non-tuberculated Lepra.*

JOS. P—— (born at the Asylum), aged 7 years, black boy,

whose mother is a leper. Under the author's observation for three years. He was never vaccinated. About two years ago symptoms of nerve-irritation, particularly along the nerves of the forearm, required the administration of Dover's powder at night, followed in six weeks by a spot on the left temple the size of a shilling, and bright yellow in colour. This spot was soon succeeded by others in various parts of the body, also yellow in colour, of all shapes, and level with the skin, but not anæsthetic.

State and Condition, August 27th, 1879. *Two Years Diseased.*—Body badly developed for his age. Has scabies. There are leper spots on both cheeks, arms, forearms, thighs, front of legs, and on the back. They are level with the skin ; not anæsthetic, except perhaps the centre of one on the left temple. The skin appears as if stained yellow, or as if the black skin was stamped with yellow marks. There is marked tenderness over both ulnars at the bend of the elbows. Nothing else abnormal.

Case XVIII.—*Illustrative of the Preliminary Stage of Non-tuberculated Lepra.*

Alexander M. C——, aged 18 years, lives in Georgetown, and is apprenticed to a mason. His duty, when at home, is to attend a lodger in his parents' house, who has nerve-lepra,* but lives secluded in a room upstairs. None of this lad's relatives have ever had leprosy. He was first seen and examined by me on the 11th of November, 1879. I then learnt the first symptom he complained of was pain along the course of the right ulnar nerve, described as "shifting," "shooting" "stabbing," and was at times so severe that it made him ill and feverish. The fingers of the same hand subsequently got stiff and numb. A spot then made its appearance on the outer side of the right wrist, and was shortly after followed by others. It is now exactly one year since the pain in the forearm was first noticed.

Present State.—Light, coloured mulatto. There is a spot behind

* A statement I afterwards verified.

the left ear a few days old, the parts appear simply as if lit up with a rich yellow colour; there is a lighter coloured spot on the forehead somewhat heart-shaped, a form very commonly taken by the eruption in this position. There is another spot in the region of the left elbow, and the ulnar nerve in this situation is painful when touched. All these spots, with the exception of the one on the forehead, are more or less circular or oval in shape. They are irregular in their appearance and site, and but very slightly anæsthetic, requiring a careful examination to detect any loss of sensation. On the right hand, extending past the wrist, there is a pale, whitish discoloration barely discernible, but it is decidedly anæsthetic, and the right ulnar nerve seems paralyzed. Examined with a magnifying-glass the patches appear to have a glistening, watery appearance, and as if arranged hexagonally.

Case XIX.—*Illustrating the Preliminary Stage of Non-tuberculated Lepra.*

(*See* Plate VI.)

Peter M——, an African, aged 36 years, was sketched on the 3rd of May, 1878. The disease had then existed between two and three years. There was evidence of nerve-disease in both forearms. Plate VI. Fig. 1, represents the appearance of the eruption on the front of the body, and Fig. 2, that on the back.

A section of skin from one of the patches on this man's forearm was mounted by Mr. Abraham, Curator of the College of Surgeons, and the appearances are detailed in the Section on Pathology.

(*b*) *Second or Spreading Stage.*

At the expiration of from two to three years from the appearance of the prodromata, the spot will enlarge peripherally, in some cases with a serpiginous tendency, here and there blending or coalescing. In this stage their edges are nearly always raised, and their borders studded with minute vesicles which appear above the surrounding skin, and in dark races as if boldly marking out the course the spot

is taking. I have not been able to find any reference to this condition in any of the works I have referred to. Dr. T. Beaumont states,* "the margins, where not exposed to friction, are covered with a minute white powdery desquamation," but this refers to a later condition again of the leper spot. I have observed that on a leper taking off his shirt he has become enveloped in a cloud of minute desquamation, which, however, comes from the surface of the patches generally. This desquamation takes place when these vesicle-like arrangements are disappearing.

The serpiginous tendency of the patches may be best seen on the extremities, apparently following or guided by the course of some nerve. They are now becoming decidedly benumbed; they have got lighter in colour, except the edges, which are darker, and they are symmetrically arranged on the body. The hairs on the patches are turning white from atrophy, and the secretion of sweat is entirely suspended by this time. The particular portion of skin affected has a dry wrinkled look, one part of the body being thus made to look older than another. The appearance of the eruption in the second stage is delineated in Plate IX., where it may be seen mapped out as it were into islands and continents. Ulcerations are never seen in connection with the non-tuberculated spot. Those on the front of the chest are generally smaller and solitary. They are rarely seen on the neck. Although the patches have a tendency to spread around joints, the latter are mostly occupied by a psoriatic or eczematous eruption.

When this stage has been reached the disease may be said to be fully developed, and there will then commence the structural changes and mutilations so remarkable in this form of leprosy. The anæsthesia of the limbs extends, and the hands and feet having become devoid of feeling, contact with the fire causes the formation of other large blebs or bullæ, which also give rise, on bursting, to unhealthy ulcerations. These accidental burns,

* "Medical Reports on Leprosy in the East Indies," p. 234.

with the resulting cicatrices, are a distinguishing feature in the disease, and are very characteristic of nerve-lepra.*

On raising up the foot a characteristic ulcer will be found underneath. This commences from a slight wound, generally a nail, splinter of wood, a stone, &c., an ulcer forms which refuses to heal and may exist for months. Around this ulcer the loss of feeling becomes greater as the sore gets deeper, the most frequent sites being under the metatarso-phalangeal joint of the great toe, the little toe, or at the heel. The ulcer itself is conical in shape, with the edges blackened; it exudes a thin unhealthy pus, and has its apex at the bone, which, after a time, may be seen at the bottom of the wound necrosed, and eventually removable with the forceps. I regard these ulcers as pathognomonic of non-tuberculated lepra; they will be found in almost every case occurring among people who go barefooted.

The spots, still bright in colour, are taking over large portions of skin area, or a pale discoloration of the skin may have taken place over a forearm or greater part of the leg, barely distinguishable from the surrounding skin by an unpractised eye, but with the functions of the part disturbed, and anæsthetic in a marked degree. There may be paralysis of sensation in other parts besides the immediate place occupied by the patches; the latter in some part of their course will assuredly become anæsthetic, and this is the great difference between them and other eruptions, including more particularly the tuberculated spot. The anæsthesia of the limbs may extend as high as the elbows, and knees, or even higher.

The patches now appear drier, glistening, benumbed, and they

* I have already explained that lepers are affected, in this form, by various bullæ. In the earlier periods small ones are raised on the extremities, it was stated, from disturbed nerve-influence, whilst in the second and third stages other bullæ are met with (or, as they have been termed, "pemphigus solitarius"), which differ from the others in being single, appearing suddenly, and on benumbed surfaces, whilst the former appeared on sensitive surfaces. The latter are similar to those met with after traumatic injury to a nerve; they are filled with clear serum—like any other albuminous—and have been described by Beaumont, Danielssen, Carter, &c., but the difference between the early and late ones has not been laid down.

bleed readily;* by spreading they coalesce and form larger ones, the spreading edge being sensitive whilst the rest is benumbed. As a rule atrophy of the paralyzed portion of skin takes place, involving, it may be, the deeper structures. During this time there may be some sound parts of skin, in a large anæsthetic area, showing they do not entirely correspond to nerve distribution, although in time the whole may be similarly affected.

The anæsthesia gradually progresses from the slightest loss of feeling to such an extent that a pin may be stuck into the muscles without the patient feeling it. Paralysis of motion takes place late in the disease.

Although the general health will not suffer to so great an extent as in T. L., yet sleeplessness and symptoms arising from disturbed nutrition will distress and annoy the patient.

The fingers become flexed, the nails clawed and talon-like. This condition of the leper's hand, and the characteristic scars, may be seen in Plates VII. and VIII., taken from a drawing of the arm and leg of Mustoo, an East Indian coolie, who died at the General Leper Asylum, on the 7th of July, 1880, five years diseased with nerve-lepra.

In this case (the dissection is detailed in the Section on Pathology) there were dislocation, atrophy, flexion, lessened temperature, and the cicatrices from burns.

The concomitant changes, then, attending the patches in the second stage are, atrophy of the muscles of the upper extremity, flexion of the fingers, vesication, ulceration, and commencing necrosis, or interstitial absorption of bone, with the formation of the leper ulcer. The sweat glands having been long affected the parts do not perspire, and a portion of diseased skin examined under the microscope shows the latter undergoing disintegration or atrophy.

* In ordinary traumatic nerve-lesions the parts do not thus bleed on incision being made into them, whereas in this form of leprosy such is invariably the case.

We have in this stage three of the chief characteristics of the non-tuberculated leper spot, viz., (1) anæsthesia, (2) symmetrical arrangement, and (3) absence of sweat in the patches.

Wherever the spot or patch may be situated, the hairs on it will be found to become atrophied. There is no change in the organs of generation such as we find in T. L., except the scrotum occasionally being affected by the leper spot in common with the rest of the skin. In the chapter on Morbid Anatomy the anatomical changes that take place in the bones of the hands and feet are more fully referred to; they are caused by interstitial absorption, gradual and progressive, or by necrosis. Thinning and dwindling away of the phalanges may be noticed in every case of nerve-lepra, the nail and pulp being sometimes transferred to the second phalanx, which is curved towards the palm. In other cases, again, where a joint of the finger or toe is about to drop off—which frequently occurs —the parts swell and become tense and glossy; soon there will be evidence of fluid beneath, becoming darker in colour from the admixture of blood, and the patient will complain of being feverish. Blebs will also form, and become quite black in a short time if left unattended to. An incision to the bone is painless, and the tension having been relieved, the joint may resume its old condition until after a time the same thing occurs necessitating another operation, when dead bone is met with, discoloured black at the bottom of the wound. In this way all the fingers and toes may be lost. The resulting deformities, although slow and taking years to occur, are nevertheless tolerably uniform and progressive in their course. The atrophy of the muscles continues to a much later stage, *pari passu* with the progress of the nerve-disease, and the paralysis will become more marked, affecting now motion as well as sensation. The hand becomes arched, the flexors appear to overcome the extensors, and the skin is shrunken and sclerotic, particularly over joints; the subcutaneous fat has been absorbed already, and some of the phalanges are drawn backwards, others being at the same time flexed, which causes the hand to assume a distorted claw-like

aspect, as shewn in some of the plates. Similar changes in the thumb give this finger a conical stumpy appearance.

Plate XI. fig. 1, represents the leper hand and arm at seven or eight years' duration of non-tuberculated lepra. The drawing is from a photograph of the left hand and arm of an East Indian coolie named Ramtohul, in whom the disease had lasted this period of time. The right arm was becoming similarly affected. He had spreading leper spots on the face, legs, and front of chest, also on the back. On the right side the muscles of the forearm were wasting, the fingers contracted, and the ulnar, median, and radial nerves could be plainly felt diseased. The condition of the part depicted commenced with shooting pains and numbness of the little finger, followed by the successive formation of bullæ, atrophy of the muscles with contraction of the fingers, exit of dead bone, and shrinking of the skin. The terminal phalanx of the little finger may be seen attached to the third, the middle one having disappeared.

It will be readily understood that these alterations and changes are directly due to disease of the nerves, the nerves of "compound function" being affected as well as the proper cutaneous nerves. The digits, it will be seen, are invariably the first to suffer, and it has been shown that one of the earliest signs of this form is numbness of the little finger followed by its contraction, and in some of the Plates may be seen the fingers of a man's hand dwindled down to the size of a child's.

The glands in the groin under certain circumstances enlarge, but they are not always enlarged as in T. L. The skin generally gets dry, cracked, and fissured, presenting a glistening, shiny appearance.

The temperature of the body will be found abnormally low, so much so that I have these cases clothed with flannel shirts. On October 25, 1877, it was noted with regard to Goram, asylum inmate, eight years diseased with nerve-lepra, Temp. in hand, 94°; bend of elbow, 96°; axilla, 99°·2. In another case the tem-

perature was 8° below the normal in the palm of the diseased hand.

Ulcerations, it may be imagined, are very common in all forms of leprosy, but they do not involve such extensive tracts of skin area as in T. L. The second stage may now, however, be said to be reached, the spots having taken over nearly the whole of the body; but before proceeding to consider the lesions met with in the third or permanent stage, a few cases illustrative of the foregoing remarks may be appropriately placed here.

CASE XX.—*Illustrative of the Second Stage of Non-tuberculated Lepra.*

Joseph H——, aged 17 years, a dark mulatto, native of Demerara, *is five years diseased.* His maternal aunt was a leper. He was never vaccinated. Is an asylum inmate.

State and Condition, 3rd September, 1878.—There are symmetrical leper patches on the temple. The one on the left encroaching on the scalp, with its edges clearly raised, and it may be seen through the dark hair, which is still growing luxuriantly.

One larger spot seems to follow the course of the left musculo-spiral nerve, and bounds its upper border as it passes round the arm. On the right arm and forearm, on the outer and back part, there are six other circular patches; there is also a large patch around the right thigh, a similar one on the left, and some on the anterior part of both legs and dorsum of both feet. These vary in size from a shilling to a small plate. To the naked eye they appear as simple stainings, light yellow or cream coloured on a dark mulatto's skin. The centres are not depressed, and examined with a glass the edges appear raised, and the spots are evidently spreading. They are quite anæsthetic in their centres, but not at their circumferences. On the first phalanx of the left index finger a large bleb has formed, the parts are swollen and anæsthetic, and dead bone is about to be thrown off. The following

nerves may be plainly felt enlarged,—viz., ulnar, at bend of elbow, and the median at the wrist. There is atrophy of the muscles of the upper extremity, contraction of the fingers, and the excavated leper ulcer under the right heel.

CASE XXI.—*Illustrative of the Second or Spreading Stage of Non-tuberculated Lepra.*

(*See* Plate IX.)

Digrooch, aged 64 years, an East Indian coolie. About eight years ago he had pain in his forearms, and subsequently lost sensation in the fingers before a spot appeared on his right side, which was followed by others on different parts of the body.

On the 24th of March, 1877, his condition is thus noted in the Register :—"Leper spots over face, front and back of chest, abdomen, thighs and legs. There are large ulcerated surfaces on both legs. Excavated ulcer under right great toe. Commencing necrosis of the bones of right ring finger.

"*Anæsthesia* (*cutaneous*).—Both forearms, from the fingers to four inches above the elbow joints, and from the toes to ankle joints, inclusive. Ulnar and median nerves thickened.

"*Eruption.*—Spots are stationary, level with the skin, and anæsthetic—more so on the right than on the left side of the body."

He was sketched on the 20th of May, 1880, and his condition, three years after the above entry was made, may be seen from Plate IX. When the spots began to spread their edges became raised and were not devoid of feeling, this being the only part of the patch not anæsthetic.

CASE XXII.—*Illustrative of the Second Stage of Non-tuberculated Lepra.*

Callychurn, an East Indian immigrant, admitted from Pln. Schoon Ord on the 9th of July, 1878; a leper five years. He was never vaccinated; has had small-pox, and is 25 years of age.

History.—From the Hospital Records it was ascertained that in

1875 he was treated for an ulcer under the metatarso-phalangeal joint of great toe; there was an eruption of spots and some degree of anæsthesia. No reference to earlier history. In 1877, he next turns up complaining that when holding his cutlass it would slip out of his hand; there was no pain in the hand. Subsequently he lost feeling in the fingers of the right hand, and his legs and feet were blistered when he went near the fire. The fingers contracting and becoming useless, he sought admission on the date mentioned.

Condition on Examination.—Eruption of leper spots with benumbed centres.

Right Hand.—Skin on the back is bronzed, and the hypo-thenar eminence has disappeared (muscles atrophied); dorsal aspect flattened.

Right Thumb.—Sensation is perfect along the dorsal, outer, and palmar aspect. There is loss of feeling (anæsthesia) along the inner side; the muscles are smaller, and he has a scar there the size of a sixpence, the result of a burn.

Index Finger.—Anæsthetic along the inner side and dorsal aspect. Commencing atrophy of the muscles.

Second Finger.—Anæsthetic along the inner, and partly the upper side; flexion of this finger by atrophy and absorption of the muscles, fascia, and the tendon of the flexor digit. subl. There is a scar from a burn on the top of second phalanx.

Third, or Ring Finger.—This finger is quite flexed, anæsthetic down to the bone, and smaller. There are three white glistening scars on the knuckles from burns. There is a cicatrix at the terminal phalanx—which has come away—puckered like that resulting from a whitlow.

Fourth, or Little Finger.—This finger is flexed and completely anæsthetic. The second phalanx is dislocated backwards.

The muscles of the forearm are wasting; the ulnar and median nerves may be felt enlarged, and pressure on the former at the bend of the elbow causes pain.

Temp. in right hand . . . . . 90°·2 Fahr.
Temp. in left hand (not so advanced) . 94° ,,

CASE XXIII.—*Illustrative of the Second Stage of Non-tuberculated Lepra.*

Joseph T——, an African, 38 years of age; no reliable family history; admitted on August 19, 1879, and ascertained to be about five years diseased. The first spot appeared on the face, then on the arms, back, legs and chest.

State on Admission.—His left little finger is swollen, shiny, and devoid of feeling, with an accumulation of bloody serum, the scalpel cutting through with hardly any pain on grating against the bone. The ulnar nerve may be felt enlarged. There are large serpiginous patches, one to the inside and back of left arm, one on the right hip going half-way round the body, and stationary, smaller patches on other sites. The patches are yellow, and show well on the dark background. The serpiginous ones have raised papular edges which are decidedly tender, the centres being level with the skin and anæsthetic.

CASE XXIV.—*Illustrative of the Second Stage of Non-tuberculated Lepra, in detail.*

Peter M——, aged 36 years, coloured creole of Demerara; illegitimate. His father, a white man, died free of leprosy; his mother also is said to have died free from any leprous taint. He was never vaccinated, and has had small-pox. He had a step-sister (same mother, but different male parent) who died a leper. The following was the order in which the symptoms appeared:—He first felt ill, had pains in the joints shooting along the forearms and hands; at night these parts felt as if pins and needles were being stuck into them. The same sensation sometimes was felt in other parts of the body. He was said to have "rheumatic pains," for which he drank a quantity of sarsaparilla. The first objective symptom noticed was the appearance of a yellowish spot on the left

temple level with the skin. It was not itchy or painful except it was rubbed, and then he "felt it burn him at once." A few months after the first spot a similar one made its appearance on the anterior part of the left wrist, followed in the course of time by another on the right leg, and then on the right wrist and left leg. About two years, or a little more, from the appearance of the first symptom, these spots all began to enlarge, *and then to lose sensation.* His left little finger, which had been numb, became flexed and "began to wither," the remaining digits becoming similarly affected until the hand was rendered quite useless. A year later, when the disease had lasted three years, the spots at the wrists had spread as far as the elbows, and those on the legs to the nates on to the abdomen. An ulcer formed under the right foot, caused by a wound from a nail, which became indolent; it subsequently healed, but again appeared and remains there still. At this time he lost sensation gradually from the toes to the knees, and within the last year the same is happening to the left foot and leg.

The patches have now taken over both feet and legs as far as the hips; the hands and arms up to and including the shoulders; the head, face, and neck. Except the lower portion of the abdomen, the rest of the body is free.

They are a shade lighter than the natural mulatto's skin, except at the right arm, where the spot is enlarging upwards, and the line between sound skin and patch is clearly marked by darker and raised edges. The glands in the groin only enlarge when the feet and legs are troubled with ulcerations.

CASE XXV.—*Illustrative of the Second Stage of Non-tuberculated Lepra.*

Gerard O——, aged 14 years; light-coloured mulatto, native of British Guiana. Parents dead; all his family free of leprous taint. His father was a sick-nurse (hospital attendant, compounder,* &c.),

* Some of these men either practise as quack doctors during their tenure of office, or set up as such in the various villages of the country.

and had a coolie who was suffering from leprosy living in a part of the same house, and under the father's care and treatment. Gerard and this leper were constantly together. The disease in this case is about three years' duration; the earlier symptoms are not accurately remembered.

State on Examination.—Body well developed, except the face, which seems smaller in proportion to the rest of the body. There are no enlarged glands in the groin. The hair on the eye-brows, lids, head, &c., intact. There is an irregular patch, about an inch in diameter, over the left half segment of the upper lip. It is not raised; it is of the colour of a white man's skin, and shows out well from the surrounding mulatto's skin.

There is nothing else abnormal with regard to the head, face, ears, neck, thorax, and abdomen. There is a circular patch over the right shoulder, and one on the left shoulder. They are barely discernible, so slight a change is there in the natural skin-colour; they are dry and scaly (?), like a patch of psoriasis vulgaris, *but they are anæsthetic.* On the outer part of the left arm there is an oval patch, also light in colour, but with the edges raised. Another on left side involves the outer part of the elbow-joint, larger, but of the same colour, and its edges are also raised. Two or three smaller ones, the size of a shilling, are appearing on the anterior aspect of the left forearm. All these patches are benumbed in some part, and there is diminished sensibility with regard to both forearms generally. On the right arm a serpiginous patch, similar in character, follows the course of the musculo-spiral nerve. The right ulnar nerve may be felt thickened; and the little and ring fingers of the right hand are flexed, useless, and devoid of feeling.

The fingers began to get stiff and became flexed before the spots made their appearance.

He has one large patch on the right buttock, three inches in diameter, white and glistening in the centre, but the edges are raised; the latter have a scaly look and a reddish hue. This patch is surrounded by several smaller ones. There are patches on both

thighs, some long, narrow, or serpiginous, others oval in shape. All have the same characters—viz., white, glistening, benumbed centres, *raised, darker coloured edges*, and are evidently spreading. There is well-marked anæsthesia in the parts between the toes and knees.

CASE XXVI.—*Illustrative of the Second or Spreading Stage of Non-tuberculated Lepra.*

(*See* Plate X.)

Francis Smart W——, negro, native of British Guiana, aged 47 years, admitted into the General Leper Asylum on the 19th of June, 1875. His brother's son is a leper. He can only remember that nine years ago spots appeared first on the right hip, then on left arm, left wrist, left leg, and right leg, spreading all over the latter. Then spots appeared on the abdomen, and last of all on the face.

He was sketched on the 24th of May, 1880, and presented the appearances shown in the Plate. All the patches were then anæsthetic, and some may be seen extending, for instance, up the arm to the shoulder. There were all the signs of advanced nerve-lepra present. With reference to this case the following entry was made in the Register under date the 22nd of March, 1877:—

Present State.—Black man, grey hair.

Eruption.—Spots :—light yellow on dark ground, a large one on the left pectoralis major, one large and three smaller ones on the abdomen, one on the front of neck, one each on right deltoid and biceps, one on the anterior and one on the posterior part of the same forearm, one around the elbow joint, one on the forehead, the upper lip, and left cheek. One large patch includes the lumbar regions, extending over the buttock down to the knees ; both legs have patches on them. Contractions of the fingers and thumbs; first joints on first and second fingers have disappeared; fistulous opening on the third, through which dead bone has just come away. Ectropion; the first phalanx has gone from the left great toe ; the

others are contracted and atrophying. All the right toes have disappeared.

Anæsthesia.—Centres of patches down to the true skin. Complete cutaneous anæsthesia up to the insertion of the deltoid on the left side, and on the right up to the elbow-joint in front, and to the middle of back of forearm. Complete cutaneous anæsthesia of both legs and feet up to the knees.

(*c*) *Permanent Stage.*

It is a clinical fact that within the last few years of the patient's life the eruption will be found to remain stationary, while the other symptoms seem to have reached a climax, and the disease to have attained its full development. Where the deeper structures are not so much implicated the eruption takes over larger portions of the body, but when extensive mutilations &c. have occurred, this has been more limited in extent. I have seen almost the entire body taken over by one huge discoloration, occasioned by the blending together of the patches; a blight has apparently passed over the external surface of the frame withering its vital structures, and causing a perfect atrophy of pigmentation.

In about ten years the permanent stage may be said to be reached, when, in addition to the lesions already described, muscular paralysis will be found to supervene. With regard to the face, the third pair of nerves are affected, the lower lip dropping from paralysis of the orbicularis oris, the saliva dribbles away, and the face is drawn to one side. The lower lid is also affected from a similar cause, giving the patient the peculiar appearance depicted in some of the Plates. Ectropion may also result from a sclerosed condition of the integument. When the muscles of the leg are affected, which generally occurs on the left side, the leg or foot in walking is raised unusually high, the limb is dragged and swung round as it were, the heel at the same time being drawn up. In these cases dementia may sometimes be met with, not necessarily connected, however, with the leprous state.

It is at this stage of the affection that the temperature will have reached its lowest limit, several degrees below the normal. The condition of the skin, lighter coloured and glistening all over, is highly characteristic; there is an absence of cutaneous sensibility and of perspiration; the proper surface of the skin itself atrophies as well as the subcutaneous fat, becoming prematurely wrinkled, in marked contrast to any healthy part, and the entire surface of the body is changed.

The anæsthesia may now extend down to the muscles of the leg or arm.

Mention has been made of certain ulcerations, but the necrosis of tissue which in tuberculated lepra is more superficial, in this form extends deeper, and a sort of moist spreading gangrene results, or dry mummification sets in, which is only arrested at a joint. Self-amputation of a limb may thus be witnessed; a line of demarcation forms, the joint is opened, and the parts amputated as if by the surgeon's knife, and a sound stump left behind. The gangrene spreads very slowly and only one part is attacked at a time, the patient is thus enabled to bear up under the process. Non-tuberculated lepra is less exhausting, and its course more prolonged, than T. L. When a finger becomes useless from atrophy lepers may be seen lopping off the part with a knife or chisel.

As soon as the permanent stage is reached there seems to be for a time an accession of strength, no active action appears to be going on; when this takes place in a limb amputation of the part affords relief, and the wounds heal with rapidity. In these cases virile power is not lost as in T. L. In leper asylums it is with great difficulty the sexes are kept separate, and births among them not unfrequently occur.

The following cases will illustrate this form and stage of leprosy; in some cases the earlier symptoms are referred to more in detail in order to complete their histories :—

CASE XXVII.—*Illustrative of the Third or Permanent Stage.*

(*See* Plate XII.)

Benjamin S——, negro, native of Demerara, aged 26 years. Family are all free from leprous taint. His parents are dead. He has one brother and sister alive, and healthy. He has now been an inmate of the Asylum for four years. He lived on the Island of Wakenaam, where there also lived a leper, Phillip F——, whom his father advised him never to go near, but when the latter was at work Benjamin would carry water to him, bring fire for his pipe, eat with him, and remain with him nearly all the day. This intercourse lasted for some months. He was then twelve years of age, and it was at this time his sickness commenced. He felt "bad all over his body;" suffered from flying pains in his arms and legs, which lasted nearly six months, and in about a year from the earliest symptom spots made their appearance simultaneously on either cheek. They were yellowish, and about the size of a shilling-piece. Three months afterwards a spot appeared on each breast, and two on the outside of both thighs, with about the same interval of time. At the expiration of two years from the commencement of the illness the spots on the breasts became anæsthetic and began to enlarge, subsequently taking over the shoulders, arms, and forearms, down to and including the hands and fingers; he lost sensation in the portions of skin occupied by the patches. Whilst they were spreading he noticed the hand and forearm "withering," and the fingers becoming flexed. When a spot was spreading through the scalp he experienced attacks of headache. Matters remained stationary for some years, but no satisfactory account is given of the exact time, and the next occurrence noted was permanent contraction of all the fingers. Around the first joint of the little finger a swelling, "like a whitlow," took place, burst, and discharged matter; the nail dropping off left an unhealthy ulcer which involved the next joint, which also became swollen in the same way, the bone loosened and came away blackened; after a while the next joint similarly suffered, until he lost the entire finger,

when the wound healed with a smooth cicatrix. This occurred fourteen years after the first appearance of the disease. One day, in running, a broken bottle cut his foot, an ulcer formed which became chronic. His great toe suffered in the same way as the fingers until he finally lost it. After losing the finger and toe and the ulcers had healed he felt in better health, although the anæsthesia in the upper and lower extremities was daily becoming more marked. One day an over-loaded gun burst in his hand, causing little pain but blowing away the two first joints of the next four fingers of the left hand. The wound bled very much, but soon healed. He next stood on a lighted coal without knowing it, a bullæ formed, and matter and blood was let out, but an ulcer remained in consequence which lasted two years. Next the other great toe disappeared, followed by contraction of the remaining ones. Since he came to the Asylum, having to cook at the fire, his hands would blister without his feeling it. He subsequently lost the fingers on the right hand by necrosis.

The spot on the cheek spreading over the face, paralysis of the portio dura on the left side supervened; at the same time the left leg began to drag.

State and Condition on the 8th of December, 1878.—There is partial paralysis of the left side of the face, and of the extensors of the left thigh. There is anæsthesia wherever there is discoloration. The muscles in connection with the left thumb are atrophied, and the finger flexed and claw-like. The little finger of the same hand has disappeared, leaving a conical stump. Where the gun-shot wounds were can hardly be distinguished from the others, but the stumps of these fingers are not conical or as smooth. The hands are arched and attenuated, with scars over the knuckles. He has lost the right thumb, the first joint of index, and two joints of middle finger; those of first and fourth healed with conical stumps, by which the leprous process may be known. He has lost cutaneous sensibility as far as the shoulders.

The left foot appears as if amputated at the metatarsal joints

where the parts separated; an indolent ulcer remains there showing the diseased action is likely to go on. The left foot is minus the great toe, and underneath there is a conical, excavated, indolent ulcer which has for months been discharging a glairy mucus. He is devoid of cutaneous sensibility as far as the groins. His bright, black eyes shine out from the yellow diseased skin of the face with a peculiar brightness. One patch has taken over the face, scalp, shoulders, and arms to the fingers, even to the palms of the hands. He was sketched at this date, and the appearance of the eruption may be seen in the Plate. The breasts are natural; there are enlarged glands in the groin, but none in the axillæ or neck. The hair on the head is intact, but it is commencing to turn grey. There is no change in the organs of generation. The ulnar and posterior tibial nerve are thickened and enlarged.

CASE XXVIII.—*Illustrating that the gravity of the case is not necessarily in proportion to the extent of diseased cutaneous surface.*

Charles Malony H——, under observation two years; coloured Barbadian boy, aged ten years; hereditary on mother's side.

Examined 5th July, 1879. *Diseased six years.* General health fair, and body well nourished, but is nearly all taken over by a light discolouration of the skin, there remains natural only a few patches on the neck, portion of left cheek, part of the chest, both axillæ, abdomen (part of), and the feet.

There are superficial ulcerations; the fingers are contracted; portions of fingers and toes lost. The discoloured patches are decidedly anæsthetic. The scrotum is discoloured.

CASE XXIX.—*Non-tuberculated Lepra of Twenty Years' Standing.*
(*See* Plate XIII.)

James W——, aged 42 years, negro, native of Demerara, single, his parents died free of leprous taint, but there is a history of collateral heredity in his first cousin. He had small-pox before

leprosy. He is a carpenter and was employed shingle-making up the Rio Demerary, where he was exposed to much hardship. When twenty-two years of age he had "pains" in different parts of the body, in skin and joints, running along the course of the nerves, and like *rheumatic pains*. He suffered also from malaise, disturbed dreams, such as falling over precipices, getting drowned, &c., and he experienced numbness in his right little finger. These symptoms had lasted from four to six months when he noticed a spot to the inside of the left thigh, circular, and yellow in colour. At times this spot itched him, and hurt him when he rubbed it a while. Then other spots appeared on his back, fore-arms, and forehead, all circular in shape. The time that elapsed from the appearance of the first to that of the last patch was three years. With the appearance of the spot on the thigh his little finger began to contract, and during the three years the spots became anæsthetic. At the end of this time the patches commenced to spread, their edges feeling "grainy." Now loss of sensation began in all the fingers of both hands, and they contracted and one after the other became permanently flexed. Next, a sore formed underneath the meta-tarsal joint of the little toe, and numbness of the toes set in, the patches meanwhile continuing to spread. The following changes occurred with regard to the toes: one phalanx was forced back as it were, the other being dragged forward, the result being to shorten or draw in the digits. Through the last-mentioned sore bones were discharged quite black, a collection of matter having first formed. During the succeeding ten years the following changes were going on, the patches spreading and blending; fingers and toes becoming distorted; anæsthesia more marked; the formation of sores with the discharge of dead bone; atrophy of the hairs; atrophy of the tissues; formation of cracks, or fissures over joints. When a finger became useless from atrophy, he would take his chisel and chop it off, as he had lost all feeling as far as the wrist-joint. The appearance the hands presented may be seen in the Plate. As soon as the patch had taken over nearly all

the face, he became partially paralysed on the right side. His left leg is dragged in walking, and the heel drawn up. Both the feet and a part of the legs are anæsthetic, and the muscles of the calf of the leg partly atrophied. During the past five years the disease has remained stationary. No change has taken place in the organs of generation, and his appetite has been fair throughout. During the past three years he has been only twice admitted into the Infirmary. The spots have taken over nearly the whole of the body; they are quite level with the skin, perhaps their centres may be slightly depressed. A prominent spot on the man's forehead is highly characteristic of this form of leprosy. The portions of body not invaded by the eruption are scalp, abdomen, part of thighs, parts of forehead; the rest is discoloured a light yellow, and all of it benumbed.

Case XXX. — *Illustrating self-amputation in Non-tuberculated Lepra.*

(*See* Plate XIV. Fig. 1.)

This drawing is from a photograph of an inmate of the General Leper Asylum, Mahaica, an East Indian coolie named Jeun, aged 45 years; for fifteen years diseased with this form of leprosy. Nearly all the body is discoloured with leper patches or spots. The disease has been stationary during the past five years. His intellect is unaffected; his appetite good; he sleeps badly, but works well all day mopping the verandahs, cleaning the yard, &c. The stumps of the hands are smooth, and were cleanly amputated in the manner described through the metatarsal joints. On the left foot the phalanges have been thus amputated, and the right foot through the metatarsal.

Case XXXI.—*Non-tuberculated Lepra complicated with Hemiplegia.*

William I——, negro, native of Demerara, aged 25 years; was never vaccinated; has had small-pox and repeated attacks of Colony fever. Father is alive and healthy; mother dead, but cause of death

not known. He has two brothers and one sister alive and free from leprosy. Became diseased at L'Esperance, Berbice. He got feverish, felt ill, suffered from shooting pains "over the body and limbs," which lasted for two months, when the first spot made its appearance on the right nates, then on the left one; a spot next appeared on the front of the chest, from whence it commenced to spread. When the spots were spreading he began to lose feeling in his hands and fingers, which subsequently became anæsthetic, and he has since lost the terminal phalanges of the digits. He also lost sensation in the feet and legs; his toes dropped off in the usual way, and the glands in the groin enlarged from irritation, for when the ulcers on the lower extremities were painful or discharging these glands got large and painful, subsiding when the ulcerations healed. The disease has lasted now twelve years; hitherto no symptom of implication of the cerebro-spinal system has been present, but he has just had an attack of left hemiplegia, for which he is under treatment in the Institution Infirmary.

CASE XXXII.—*Permanent Stage of Non-tuberculated Lepra.*

Joseph M——, aged 50 years. Seventeen years diseased. He is black, a native of Surinam, Dutch Guiana. The first symptoms were pain along the course of the nerves, numbness in the fingers, followed by inability to bend the right little finger. The first spot appeared on the left cheek. He is now in the Infirmary with ulceration of the lower extremity. His appearance is similar to that depicted in Plate XII.; there is ectropion, paralysis of face, and the peculiar open condition of the mouth caused in the same way as the ectropion. He is covered all over with leper spots, which have been stationary for some time.

CASE XXXIII.—*Permanent Stage of Non-tuberculated Lepra in a Coolie.*

(*See* Plate XIV. Fig. 2.)

Çamolsing, an East Indian immigrant from Pln. Providence,

Rio Demerary, fifteen years diseased with this form of leprosy. The usual symptoms were present in this case. He has ectropion from paralysis of the orbicularis, together with atrophy of the structures beneath the eye. The eyelids are half an inch apart when he tries to close the eyes. He has lost all the fingers of both hands. He has lost the metatarsal and cuneiform bones of the feet, and the stumps are drawn up by the heel. He has lost sensation up to the knees and elbows. Enlarged nerves (ulnar, median, and posterior tibial) may be felt. His body is nearly all covered with the eruption.

CASE XXXIV.—*Non-tuberculated Lepra in a Chinese.*

(*See* Plate XV.)

Chang Ching Fook, male, aged 43 years; fourteen years diseased; admitted into the Asylum on the 21st March, 1872. On the 23rd March, 1880, he was sent into the Infirmary with hemiplegia, from which he shortly died. Owing to my absence no examination was made of the spinal cord in this case. The plate shews the appearances of the permanent stage of the disease as it is met with amongst the Chinese immigrants.

The Eruption in Non-tuberculated Lepra.

I find that while I am in accord with the majority of writers in regard to the eruption which precedes tuberculated lepra, its seat, nature, morbid anatomy, and early appearance, &c., important differences exist with regard to that now under discussion. In the first place, I must dissent from those who place "Lepra Leprosa" as a separate form or variety of the disease, its only characteristic being an eruption *simpliciter*, but which, from the accompanying description, would seem to be nothing more or less than one of the outward manifestations of non-tuberculated lepra, and ought, therefore, to be included in the description of that form of leprosy. I have not seen in the West Indies, in any form of leprosy, an eruption at

all corresponding to Plate II. in Vandyke Carter's celebrated work. Even in Danielssen and Boeck's monograph some confusion would appear to exist with reference to the eruption he describes and figures—*e.g.*, what is there stated as preceding the anæsthetic form (non-tuberculated), I find precedes the tuberculated form. Spots that first appear as localised and undefined flushing of the skin, which disappear on pressure, returning with a deeper hue, are what in my experience belong solely to tuberculated lepra. Such confusion is inevitable until each form of the disease is separately described, and better understood.

The eruption in this form is not preceded by febrile symptoms, as in tuberculated lepra ; and, whereas in the latter form the eruption precedes every other development of the disease, and is one of the earliest signs, the eruption in non-tuberculated lepra occurs later on, and does not as a rule make its appearance until some evidence of nerve lesion has been made manifest. This I trust has been made clear in the preceding narrative of cases. Again, in this form the skin changes accompanying the spot are due more to impaired nerve influence, the result of the leprous deposit in and around their structures, leading to (according to Hebra) "an atrophy of pigmentation."

I have not come across, in this part of the world, the local forms of lepra described by Kaposi,* where the general system was not in the least affected by them ; some symptom or sign of disturbed nerve influence has invariably been present.

This author, as well as Dr. Carter, describes "Lepra maculosa" as a distinct variety of leprosy. The experience, however, of this Asylum is—as I have already stated—that his "maculæ" are merely some of the signs of non-tuberculated lepra.

Morphœa, sometimes described under this heading, is of quite a different nature, as also leucoderma, sometimes called "White

* *Loc. cit.*, p. 156.

Leprosy," but in no way allied to or connected with true leprosy; the latter is a chromo-pathic affection common among negroes, which by the way is questioned by a high authority.*

Owing to varying degrees of pigmentation in the earlier stages the colour of the patch or spot may, and does vary; when once fully developed it will be always of a lighter colour than the surrounding skin. The eruption, proceeding in great measure from nerve impairment, leads to local atrophy, or a kind of blight, the extent of which depends on the stage of the disease, and is attended with a diminution of the natural pigment from the rete, and general structural degeneration.

Tuberculated lepra, it will be remembered, was ushered in by an erythematous eruption, accompanied by febrile paroxysms.

In Europeans, Creoles, Mulattoes, and fair-skinned people, the spots when first seen are of a light, copperish tint; in black races, they are a dirty yellow; later on, the true skin undergoing degeneration, the hue becomes lighter; in some cases they have consisted of mere pale discolourations, difficult otherwise to describe.† Non-tuberculated maculæ or spots are tolerably well-defined; their margins appear as if washed or brushed out, and this is the process adopted to obtain a correct delineation in drawing them; they do not pale on pressure; do not correspond to any fixed or defined nerve distribution, and I have never known a case of non-tuberculated leprosy to consist of maculæ alone, or without concomitant nerve disease or symptoms.

For facilities of comparison, I have placed in opposite columns the differences in the eruption of tuberculated and non-tuberculated lepra.

* Jonathan Hutchinson, F.R.C.S. "Lectures on Clinical Surgery," p. 33 *et seq.* London, 1879.

† Dr. Bakewell, formerly medical officer, Leper Asylum, Trinidad, reports ("Parliamentary Paper," 1871, p. 23): "The anæsthetic form of leprosy is characterized by pale yellow patches on black or coloured people, and darkish stains on whites, scattered about the body." Dr. Nicholson, of Antigua, states ("Leprosy Report," Royal College of Physicians, p. 20): "The anæsthetic form is not characterized by tubercles, but by patches of discoloured cuticle, resembling Pityriasis versicolor on various parts of the body, &c."

The Eruption in Non-tuberculated Lepra.

The spots do not pale on pressure. They appear oval and symmetrical; more numerous; lighter in colour; not raised at first, they afterwards become so at their edges; at first small, they subsequently enlarge, and may, by coalescing, take over the greater part of the body. The centres are depressed; the spots have a tendency to spread serpiginously, and peripherally. They remain as long as the disease lasts, and do not precede other manifestations. They are a local atrophy, and hairs turn white on the patches. They are not preceded by febrile symptoms. They are more numerous on the back of the body.

The Eruption in Tuberculated Lepra.

The spots become pale on pressure. At first they appear larger, red in colour, raised above the skin, and invariably ushered in by febrile paroxysms. They may fade, get smaller, or disappear altogether, and are not symmetrical. Spots more circular. A local erythema allied to the exanthemata. No such tendency to spread, and their edges are not raised. More frequently appear on the front of the body. Are the seat of tubercles. An early sign of leprosy. Hairs do not turn white, but fall out apparently unchanged.

In this eruption the patches are, in advanced cases, sometimes covered with the fine brawny desquamation already referred to. A "very slightly furfuracious state of the cuticle" has been noted by Dr. Kirkpatrick of Bangalore; and Dr. Milroy also quotes a case* where the margin of the spot was "unusually reddish, slightly raised, *with minute scabs or scurf on the surface.*" The case was evidently one of non-tuberculated lepra in the second or spreading stage, and, Dr. Milroy reports, had been mistaken for "running ringworm."

Influence of Sex.

As in the former variety of leprosy, the male sex appears to be more subject to non-tuberculated lepra than the female. The admissions into the General Leper Asylum during the three years, 1877–80, included 71 cases—viz. :–

Males	54
Females	17

As nearly as possible, three to one. In Trinidad and Demerara, a majority of the cases of this form are males, and this is the

* "Report on Leprosy and Yaws," p. 32, 1873.

experience in Barbadoes, Antigua, and other parts of the West Indies. The matter can only, however, be satisfactorily settled by a correct leper census of the various colonies, the different forms of the disease being carefully noted.

Relative Frequency.

The number of patients suffering from non-tuberculated lepra greatly outnumber those suffering from the tuberculated. Referring to the admissions at Mahaica during the period mentioned, to preserve a comparison between the various statistics, there were admitted :—

Tuberculated cases . . .	21	per cent.	of total admissions.
Mixed Tuberculated cases .	17	,,	,, ,,
Non-tuberculated ,, .	62	,,	,, ,,

On December 31, 1878, there were in the leper asylums of the colony :—

Cases of Tuberculated Lepra	40
,, Mixed Tuberculated Lepra . . .	34
,, Non-tuberculated Lepra	133
Total	207

Again, among the 188 cases already referred to, with reference to the form of disease in that series, there were :—

Cases of Tuberculated Lepra	34
,, Mixed Tuberculated Lepra . . .	51
,, Non-tuberculated Lepra	103
Total	188

Nerve-lepra thus occurs more frequently in the West Indies than the tuberculated forms, although, on the occasion of a visit to the Cocorite Leper Asylum, Trinidad, in July, 1880, there happened to be on that day a larger percentage of the latter, but which I learnt was not always the case. A similar preponderance prevails

in India, for in Bombay the relative frequency of the three forms is stated to be :*—

Anæsthetic (Non-tuberculated)	36·1 per cent.
Tubercular (Tuberculated).	9·0 ,,
Anæsthesia with Tubercles (Mixed Tuberculated) .	21·0 ,,

In Carter's Table, however, if the number of cases under the heading "Eruption and Anæsthesia," which properly come under the head of Anæsthetic Leprosy, were added thereto, the relative frequency for India would then read :—

Tuberculated	9·0 per cent.
Mixed Tuberculated	21·5 ,,
Non-tuberculated	61·9 ,,

With regard to Norway, Danielssen and Boeck give the statistics with reference to the relative frequency as :—

Anæsthetic Leprosy	33·3 per cent.
Anæsthetic with Tubercles. . . .	15·1 ,,
Tubercular	51·6 ,,

Shewing a greater frequency of the severer form of leprosy in cold climates. In some districts, however, of the diocese of Bergen the anæsthetic form predominated.

As regards Age.

The earliest age at which I have seen the disease well marked is four years. One case I examined on September 17, 1877, at the Asylum. Her mother, Ellen B——, was an inmate of the institution, and the child (Ida) was born there. It was ascertained that her age was four years ; she had the characteristic yellow spot on the left cheek, and other symptoms of the disease. Ida has a sister two years older (6 years), who is only now developing leprosy. Dr. Fiddes, of Jamaica, states :†—"I have not met any case of anæsthetic earlier than the eighth or ninth year, and not later than the meridian of life." Drs. Manget and Pollard of this colony have seen cases of non-tuberculated lepra at eight years ; and from

* Carter, *loc. cit.*, p. 108, Table 2. † "Leprosy Report," p. 21.

St. Lucia, W.I., it is reported that "in the offspring of lepers it may appear at birth" ("Leprosy Report"). Many writers have given their experience of the time at which the disease generally appears, but the varieties of the disease not being differentiated, the statistics are of no use in this particular. Leprosy may appear at any time after birth, but in the form now under discussion seldom earlier than the fourth year of age.

In a table I have given the average ages, on admission, of all the cases. The oldest male case admitted was 68 years; the oldest female 60 years. The youngest male admitted was 6 years; the youngest female 14 years.

Average Age of the Cases on Admission in Years.

Tuberculated Leprosy.		Mixed Tuberculated Leprosy.		Non-tuberculated Leprosy.	
M.	F.	M.	F.	M.	F.
27	29	22	34	36	37

From this table it would appear that non-tuberculated lepra affects the patient at a later age—some ten years—than the tuberculated. In the case of children the disease makes its appearance from eight to twelve years of age, and a little earlier when it is said to be hereditary. The above table shows that it is most common about puberty, for it may be presumed that the disease had lasted some time before admission. In another table I have given the ages on admission of the cases in decennial periods.

Table of the Ages of 71 Non-tuberculated Cases on Admission.

1 to 10 years.	11 to 20 years.	21 to 30 years.	31 to 40 years.	41 to 50 years.	51 to 60 years.	Over 60 years.
1	8	16	23	14	8	1

from which it would appear that 55 per cent. of the cases were between the ages of 20 and 40 years. This table should be compared with that given on page 46, as similar statistics for separate forms are not, as a rule, available for reference.

The next table gives the ages at death of seventy-one cases which proved fatal between the 1st January, 1876, and the 31st December, 1879, from which it will be seen that nearly 75 per cent. terminated their existence between the ages of 30 and 50 years.

Table of Ages at Death; Non-tuberculated Cases.

Before 20 years.	21 to 30 years.	31 to 40 years.	41 to 50 years.	51 to 60 years.
2	5	19	34	11

The average age at which they died was 44 years. The oldest male was registered at 73 years; the youngest, 10 years. The oldest female, 65 years; the youngest, 23 years. If we allow 15 years (see "Duration") as the average duration, deducting this from 44 would give 29 as the age at which the disease commences. We have already seen that 55 per cent. of the cases became diseased between the ages of 20 and 40 years.

Duration of Non-tuberculated Lepra.

The average duration of this form of leprosy among seventy-one patients who died at the General Leper Asylum was ten years. Those cases, however, may be said to be somewhat exceptional, inasmuch as only the worst and most destitute are received into the asylums; in fact they are often brought there in a dying state, the friends hoping thereby to avoid the expenses of the funeral; an average duration from such statistics would be therefore misleading. From uncomplicated cases which have come under my observation, whose histories were reliable, and, from a study of the death list, I have estimated the average duration of nerve-lepra in the West Indies at fifteen years. It must be remembered how frequently the disease is cut short in its course by some intercurrent affection; and that it may, with care and treatment, be extended for twenty, or even thirty years; when it has been preceded by syphilis or small-pox the duration has been much shorter. Cases of nerve-lepra attain their full development in ten years, and prove fatal, generally, between 40 and 50 years of age.

Influence of Race.

The non-tuberculated cases admitted were of the following races—viz. :—

Blacks, or Negroes	38
Coloured Creoles	3
East Indians	19
Chinese	5
Portuguese	5
European	1
Total	71

More than fifty per cent. were thus negroes.

The following table shows how the races were affected in the three forms, with reference to 115 admissions, and also to what an extent the black race suffer from the nerve affection in the tropics.

Form of Leprosy.	Race.						Total.
	Negro.	Coloured Creole.	East Indian.	Portuguese.	Chinese.	European.	
Tuberculated	15	1	3	3	2	–	24
Mixed Tuberculated	13	–	1	2	4	–	20
Non-tuberculated	38	3	19	5	5	1	71
	66	4	23	10	11	1	115

Hereditary Influence.

Many of the remarks on hereditariness in T. L. apply here. This influence was found to be acknowledged in only twelve per cent. of these cases, but it is said to occur more frequently. I do not, however, consider it necessary to discuss the matter, further than to say it is now acknowledged that a predisposition to the disease may be transmitted. There is a patient at Pln. Melville, Mahaica, a Hindoo, aged 47 years, who has long-standing non-tuberculated lepra. He has a son aged three years. I can obtain no trustworthy history of his mother, who is dead. This child was born when the father had leprosy; he is very small

for his age; he suffers from neuralgic (?) pains in his arms, a suspicious ulcer around the metatarso-phalangeal joint of the great toe, glandular enlargements, and the skin has the peculiar shining appearance so common in early cases; in addition, the child's features seem too large for the body. This case is similar to that of the child Ida, born at the Asylum, and in another year, or less, will certainly develop nerve-lepra. The advocates of contagion would be perhaps inclined to attribute the disease to this cause, but hereditary transmission or predisposition is also a likely one. Virile power is not disturbed in this form, lepers having children more frequently than in T. L., the organs of generation not being in any special way affected.

Diagnosis.

When once the eruption has appeared the diagnosis of the disease should be attended with no difficulty; when fully established I cannot understand how a mistake could arise. The earlier symptoms are very characteristic, and in a country where leprosy is endemic should place us on our guard. I refer especially to the pain and tingling along the nerve, accompanied with numbness. The symptoms described as preceding the tuberculated form differ in many particulars. In the latter, the flying neuralgic-like pains are absent, whilst, in this form, patients do not complain of the drowsiness, palpitation, or profuse sweating. Again, we never, in T. L., meet with numbness and stiffness of the fingers, so early a symptom in the form now under discussion. When a leprous cachexiæ is present, and pain may be produced by touching, say either ulnar nerve, the pain running up and down the arm, the diagnosis, even at this early stage, may be confidently made; enlargement of the nerve will not be present till a later stage. With the appearance of the eruption all doubt should cease, the great characteristics of the spots being, their appearing singly, and on sites of selection, their chronic course, tendency to spread, and soon becoming benumbed or anæsthetic. The absence of perspiration, from implication of the

sweat-glands, is another characteristic, and a very important one. The spots, moreover, will have been preceded or accompanied by some sign or symptom indicative of nerve mischief. The negative character of the patches will also aid the diagnosis, together with their tendency to arrange symmetrically. The hair on the surface will become white from atrophy; there is no itching, except, perhaps, on their first appearance, and no scaling.

The eruption might be mistaken for the following:—

(1.) *Leucoderma.*—Reference has been made to this affection when dealing with the eruption. For the purposes of diagnosis it may be mentioned that in Leucoderma the spots are level always; they have a rosy look; the functions of the skin are not interfered with, and there is never present anæsthesia.

(2.) *Latta, or Leuta.*—This is merely a pigmentary alteration, common among the negroes and coloured creoles, and easily curable. Dr. Steventon, of Montsenat,* erroneously refers to it as an early stage of leprosy, with which disease, however, it has no connection whatever.

(3.) *Morphæa.*—Although Kaposi, in Hebra's "Diseases of the Skin,"† includes morphœa under the eruption of non-tuberculated lepra, they are quite distinct; the white and lilac rings of morphœa are absent in the leprous disease, which has no pathological affinity or connection with it.

(4.) *Psoriasis.*—Psoriasis vulgaris is often to be met with among lepers, the arms and legs being the parts affected. Mr. R. McKibbin, surgeon, Queen's Hospital, Honolulu, has described "severe and troublesome psoriasis met with in anæsthetic leprosy." I have seen cases of psoriasis in white races which might be mistaken for the spots of nerve-lepra.

(5.) *Pityriasis Versicolor.*—This skin affection also is liable to be mistaken for that of leprosy.

(6.) *Traumatic Nerve Lesions.*—A very close resemblance exists between these and the signs of non-tuberculated lepra. According

* "Leprosy Report," p. 18.

† "Syd. Soc. Trans.," vol. iv., p. 156.

to Charcot* "it is above all in anæsthetic lepra that we encounter, in their full development, the trophical disorders which we have studied in connection with traumatic nerve lesions," and which at p. 20 are thus referred to: "The accidents which traumatic nerve lesions may occasion in the integuments are of several kinds. The first includes eruptions of various forms, but chiefly those characterized by vesicles and bullæ. The second kind includes pemphigoid eruptions. . . . Here we see the pemphigoid bullæ developing with great rapidity, and reappearing, from time to time, on different parts of the tegumentary system, supplied by the wounded nerve." Brown-Séquard's experiments on guinea pigs, &c.,† shewed that ulceration of the toes, and loss of nails, &c., took place on section of the sciatic nerve, followed after a time by atrophy. Three cases were lately sent to the General Leper Asylum, as lepers, who, on examination, were found not to be suffering from this disease: *No.* 1 had simply scabies inveterata, and was soon cured with proper regime, and sulphur baths. *No.* 2 had Latta or Leuta, and a contracted and atrophied finger from injury to the nerve. *No.* 3 was a case of psoriasis vulgaris, the patient having general anasarca, and glaucoma. The following are the particulars of case No. 2, extracted from the General Register of admissions: "Armagun, male, East Indian immigrant from Madras, aged 37 years, Register No. 36, admitted 26th July, 1878, the certificate stating he was three years diseased with anæsthetic leprosy. There are some light-coloured discolorations (Latta), but they lack the characters of true leper spots. There is a contracted condition of the index finger, with the muscles partly atrophied, stated to be the result of a machinery accident. There is no anæsthesia, or evidence of leprous nerve implication. There is left leucoma, and right ophthalmia tarsi."

(7). *Tropical Ringworm.*—Cases of tropical ringworm have been

* "Lectures on Diseases of the Nervous System," by J. M. Charcot. Translated by Dr. Sigerson. New Syd. Soc. p. 26.

† "Sur les Alterations Pathalogiques qui suivent la Section du Nerf Sciatique," 1849.

diagnosed as leprosy, and *vice versa*, but with the improved method of diagnosis such mistakes are simply the result of carelessness.

Prognosis.

As far as our present knowledge goes, when once the disease has been fully developed, there is no hope of a lasting or permanent cure. This form, however, is milder, and runs a much longer course than tuberculated lepra, in fact nearly double. In either case the unfortunate victim has a dreary, miserable future to look forward to: the spots will spread; the joints one by one will drop off; and the patient, if he escapes the intercurrent diseases, must eventually succumb to the exhaustion which attends the last stages of the disease, the natural duration of which has been stated to be fifteen years.

The favourable signs are, an absence of hereditary influence; freedom from debilitating illnesses; the amount of anæsthesia, and consequent extent of nerve disease, being of limited extent. There may for a time be comparative freedom from the severe effects of the disease, and if it is seen sufficiently early it may be even arrested by treatment.

Sensation to the benumbed patches, and the functions of the sweat glands, may be restored if the disease is not too far advanced, and the enlargement of the nerves may also be reduced. These cases may end fatally from atrophy or exhaustion, or from the effects of some complication arising during their course.

Complications and Modes of Termination.

From the list of cases of death occurring among patients with A. L., during the past few years, I find the following, in the proportion stated, are referred to as having caused the termination of the patient's life—viz. :—

Exhaustion from Leprosy (either from the ulcerations, gangrene, atrophy, marasmus, or general debility)	42 per cent.
Muco-Enteritis	36 „

Dropsy	11	per cent.
Lung affections, including phthisis . . .	3	,,
Peritonitis	2	,,
Remittent Fever, Hemiplegia, Jaundice, Dysentery, Valvular Disease of the Heart, Epilepsy, each one per cent.	6	,,
Total	100	,,

From this statement it may be seen that next to the direct effects of leprosy, which will again be alluded to, the largest mortality was caused by muco-enteritis.

This usually is chronic, attended with a mucous, sometimes bloody discharge, and is invariably attended with pain over the descending colon, where, on *post-mortem* examination, ulcerations were frequently met with. While in T. L. diarrhœa was stated to have caused ten per cent. of all deaths, in this form we find this complication causing thirty-six per cent., and ulcerations of the coats of the intestines are almost invariably to be met, the diarrhœa of the former proceeding from ordinary climatic causes or conditions. These ulcerations will nearly always be found in the large intestine, and would appear to be the result of a muco-enteritis occurring in the later stages of the disease, the ulcers being formed in the long axis of the bowel, glazy-looking and in patches; there is no tenesmus; a rapid wasting of the system attends it, and failure of the vital powers, with a tympanitic condition of the abdomen generally.

Dropsy is only half as frequent in this form, and there is this difference, that whereas in T. L. it is frequently, or nearly always the result of albuminous nephritis, in non-tuberculated cases it proceeds from ordinary causes.

The remainder do not call for special remark, except the specific cause of death, so to speak, exhaustion from the effects of the leprous disease or leprotic decay, which is credited with having caused 42 per cent. of all deaths.

Leprotic Decay.—Gangrene, as a cause of death, does not appear in the table for tuberculated lepra, and, considering the pathology of the disease, it can readily be understood why gangrene so frequently occurs, and may prove fatal. Even in persons free from leprosy, but who become debilitated from climatic causes or destitution, especially new comers to the colony, the slightest irritation is likely to set up diffuse inflammation or gangrene. In leprous gangrene a line of demarcation frequently forms, and the parts separate, the patient only succumbing to repeated invasions.

That leprosy may terminate life by exhausting the natural powers, so that it may not longer be maintained, cannot I think be doubted. The ulcerations that reduce the patient are the direct consequence of the disease, and are part and parcel of it. So also are the loss of appetite, failure of the vital functions, and the general debility which sets in after a certain lapse of time. A few days before death, the mental faculties being unclouded, the patients will be found to refuse all food; they do not appear to suffer pain, but lie uncomplaining and listless, dying gradually without a struggle.

Mortality among Non-tuberculated cases.

The average annual mortality for the past three years was 10 per cent., or half the number that obtains in T. L. The mortality was calculated on the number of deaths to strength, and with the following result for the different forms :—

Tuberculated.	Non-tuberculated.	Mixed Tuberculated.
20 per cent.	10 per cent.	12 to 15 per cent.

The small mortality among those with nerve variety shews the milder nature of non-tuberculated lepra. Females are affected fatally in the same ratio as males, whereas in T. L. the disease proves more fatal to the male sex.

Morbid Anatomy and Pathology.

The following observations will refer to—(*a.*) changes in the nerves, including remarks on the brain and spinal cord; (*b.*) changes in the portion of skin occupied by the eruption; (*c.*) changes in the bones; and (*d.*) the viscera.

(*a.*) *Changes in the Nerves.*

The pathology of non-tuberculated lepra essentially consists in a diseased condition of the nerves, the result of the leprous deposit; the nerve disease is thus a specific one, and although the signs and symptoms of T. L. and A. L. have been shown to be so dissimilar, they are nevertheless said to depend on the same morbid material.* The cutaneous nerves are principally affected, but compound nerves are not exempt, and I have in my dissections observed a predilection for, among others, the ulnar, median, radial, musculo-spiral, inter-costo-humeral, external cutaneous, and peroneal.

This nerve affection is first in the sequence of events, causing the prodromal or premonitory symptoms, and is followed by the eruption characteristic of nerve-lepra. The earlier symptoms all point to excitation of the nerves due to the irritating neoplasma; then follows chronic inflammation of the sheaths,† with the formation of neuromata after a while, for to the naked eye the diseased nerve in the early stages appears redder, swollen in parts of its course, and somewhat round in shape, becoming subsequently larger, somewhat flattened, harder, and of a dull grey colour, the enlargement being commonly perceptible during life in certain positions—*e.g.*, the elbow and at the wrist.

We are also indebted to Virchow for his investigation into the microscopical anatomy of nerve changes in leprosy, some of which, however, had been previously published by the Norwegian

* Virchow's "Pathologie des Tumeurs," p. 512.

† Virchow (*loc. cit.* p. 512) states:—"Souvent le processus s'étend d'une façon si uniforme tout le long des cordons nerveux, que l'on peut être tenté de le regarder comme une inflammation chronique (*perinévrite lépreuse chronique*)." See also Danielssen and Boeck, "Traité," &c.; "Jagttagelser," &c., iii. p. 7, 10, tab. xiii. Morris, in his work on Skin Diseases, uses the term "neuritis leprosa."

physicians referred to. I have had opportunities for confirming the opinions and statements of Virchow, and as very little new matter has been added to his admirable descriptions, and for the benefit of those, in the West Indies and elsewhere, to whom his works may not be conveniently accessible, I have added in a foot-note a translation of the part of his work bearing on this subject.*

Hebra and Kaposi (*loc. cit.*, pp. 175-7) were of opinion that the cellular infiltration along the connective tissue sheath of the nerve-fasciculi and nerve fibres, "which was especially marked around the vessels contained in them," were important in their character as

* "*Pathologie*," &c., p. 513: "If we trace a long nerve, for instance the ulnar, median, or peroneal, we find, as a rule, that it is swollen, not uniformly but at certain intervals. These swellings are most frequently met with at parts most exposed to mechanical influences or changes of temperature, either on account of their relation to the bones or of their superficial position. Thus, for instance, I have found the median most diseased where it passes over the carpus, beneath the annular ligament, whilst the ulnar was always most enlarged at the elbow. A change in the colour of the nerve, gradually increasing towards the swollen portion, is noticeable. The normal white colour of the nerve gives place to a greyish semi-translucent appearance, and it occasionally assumes a brownish or blackish tint (smoke-grey); at the same time the nerve is firmer, and in some instances even hard (sclerosed). The interior of a section is more homogeneous than normal. When examined under the microscope, even a low power suffices to show the principal alterations very distinctly. The loose connective tissue (the external nerve-sheath) which seems to hold several nerve-fasciculi together is scarcely altered; at most, the walls of the blood-vessels contained within it are thickened. The nerve-sheath proper (neurilemma) is usually changed in appearance, though in different cases to an unequal extent; in some instances the alterations being very slight, whilst in others the neurilemma is transformed into a very hard callous mass. The most important changes, however, are more deeply situated in the septa within the nerve-fasciculi, and in the interstitial substance, properly so called, between the nerve-fibres (perineurium). They sometimes commence close beneath the neurilemma, in which situation we find a highly refracting material deposited; from thence they are continued along the larger septa, which subdivide the fasciculi of nerve-fibres into a number of still smaller fasciculi. When examined with a higher power, it is seen that the darker coloured material which fills the parts mentioned is composed of densely crowded cells (nuclei, Carter), and that these not only correspond to the direction of the larger connective tissue septa, but are also situated around and between the primitive nerve fibres. There thus results a well-defined picture, each nerve fibre forming, so to speak, a circle, in the centre of which may be found the axis cylinder, with a network of leprous cells disposed around it. When the affection has lasted some time I have observed two chief modifications; first, a fatty metamorphosis, well marked, proceeding from the leprous cells, and leading to the production of the great granule cells, so that, with a low power, these places appear altogether black: there is then evidently a retrogression, and it cannot be doubted that, in these cases, the deposit is capable of being resolved and completely removed, with re-instatement of functions, provided this process takes place early enough. But in the interval there often occurs another modification, and that is total atrophy of the primitive nerve-fibres."

symptoms of the disease, but were not pathognomonic of lepra, as "similar changes in the nerves, and consequent disturbances in their functions (insensibility), are to be found present, though rarely so, in the nerve trunks in the immediate neighbourhood of any part affected with chronic inflammation, *e.g.*, elephantoid thickening in consequence of lupoid ulcerations and gummatous affections."

Danielssen, who was of opinion that there was an inflammation of the sheath of the nerve, asserted that this was followed by the deposit. I am inclined to think that matters should be reversed, the deposit being the cause and not the effect of the inflammatory action. Charcot* taught that lesions, analogous to those met with in nerve-lepra, which succeed traumatic nerve lesions, seem due to a "neuritis."

A glance at Plate VII. p. 80, will show that the nerve changes there figured are similar to those described by Danielssen, Boeck, Virchow, Carter, and others. In this plate are depicted the appearance the nerves presented in the forearm of Mustoo, an East Indian coolie, five years diseased with nerve-lepra, whom I admitted in a dying state, with chronic diarrhœa, on July 6, 1880. Sections of the ulnar and external popliteal nerves of this case (see Plate VIII.) have been examined for me by Mr. Abraham, who reports thereon as follows :—

Ulnar Nerve of Mustoo, diseased five years.

A transverse section through the enlarged part of the nerve near the elbow shows thickening of the sheath with an interfibrous granular deposit, and with a thickening of its individual fibres, which sometimes have a hyaline appearance. Just within the sheath and along the septa a more or less copious irregular growth [H, I *a*], has invaded the tissue, the cells being generally small, and with darkly-stained nuclei. In some of the nerve bundles this growth extends even between the individual fibres.

The changes in the nerve-fibres themselves are very remarkable.

* "Diseases of the Nervous System," p. 23.

Most of them show no evidence of an axis-cylinder, the whole thickness of the fibre having a granular look without the slightest differentation. Some are much increased in diameter, and the homogeneous substance of these is more hyaline in appearance. In others the fibroid degeneration is less complete, and in a few the cross-section of the nerve fibre appears to be quite normal. There is occasionally to be observed a slight interfibrous granulation.

In the longitudinal sections, and in teased preparations of the same nerve, the fibrous and homogeneous texture of many of the individual nerve-fibres is quite evident. Now and then the position of Ranvier's constrictions can be made out; and in addition to the elongated nuclei of Schwaine's sheath, irregular-shaped cells are seen scattered singly or in groups—sometimes very densely. At intervals, and apparently between the fibres, oval- or spindle-shaped granular masses come into view. Occasionally these seem to possess a nucleus, giving the idea that perhaps the cell substance of a cell has become enlarged and studded with granules. In the case of some of the teased specimens the axis-cylinder is seen broken up into large and small rod-shaped pieces (Fig. I).

In the sections taken from the external popliteal nerve of a leg with anæsthetic leprosy in an early stage, very similar appearances are in general presented—viz., thickening (sometimes hyaline) of the sheath, fibroid change in many of the nerve fibrils; and in a still more marked manner are to be seen interfibrous, elongated and irregular-shaped, brownish, granular masses [K and L, *a*.] There is not, however, the same invasion by small-celled growth.

With regard to the brain and spinal cord my notes state that those examined were not found in any special way affected. I am not, however, satisfied that my methods of examination were the best, so that this important subject is still receiving attention. In the earlier stages, none of the symptoms would lead to the supposition that either brain or spinal cord was affected in leprosy, but later on hemiplegia is certainly a complication commonly met

with. Carter's remarks (p. 74), based on the examination of eight cases of this form of leprosy, are that "in all the ordinary forms of leprosy the brain and its membranes are not diseased;" and again, "the spinal cord and its membranes have been found unaffected." Hansen states that "in neither brain or spinal cord had he come upon anything abnormal." Danielssen, however ("Jagttagelser," &c., iii., p. 9), describes a congested condition of the posterior spinal veins, and an albuminous exudation in the serous tissue of the arachnoid. In advanced cases he found a considerable collection of sero-albuminous material between the dura mater and arachnoid. The whole medullary substance was surcharged with blood, and had acquired a firmness and toughness rendering it comparable to a cartilaginous material. He noticed, further, the large trunks issuing from the brachial and sacral plexuses in a state of atrophy.*

In the *Archives de Physiologie*† is an interesting paper by S. Tschiriew on the microscopical examination of the spinal cord, &c., of a leper who had been under the care of Dr. Hillairet of the St. Louis Hospital in 1875. No clinical details of the case are given, except that the disease is said to have lasted a number of years, and that the patient belonged to a rich Creole family in the Mauritius. The autopsy was made on the 28th May, 1875, and the author states there were no changes in the viscera or spinal cord perceptible to the naked eye. He mentions that the observations of Danielssen and Boeck, made in 1848, with reference to the rarefaction of the ganglion cells of the grey matter, the altered consistency and volume of the cord, were not subsequently verified; and he goes on to describe the actual changes in the spinal cord in his case as revealed by the microscope:—

In the cervical region the left posterior cornua was slightly thinner than the right; the central canal was full of small lymphoid cells (well stained by hæmatoxylin and purpurine), and its walls

* See also "Traité," &c., p. 283.

† Sept.-Dec., 1879, p. 614. "Lésions de la Moelle Épinière et de la Peau dans un cas de Lèpre Anesthétique," par S. Tschiriew de St. Pétersbourg.

and immediate neighbourhood infiltrated in a similar manner. In the grey and white substance several elongated nuclei were met with. The medullary veins were congested. In the centre of the cervical region some slight hæmorrhages were met with in the left posterior cornua; and there was cellular infiltration, with thickening of the lymphatic sheaths. As a rule, in the grey matter there appeared to be fewer blood-vessels and capillaries than in the normal state. There was no appreciable change in the anterior cornua, but in the posterior cornua the number of nerve-cells were diminished or more or less altered. The grey matter in these regions was more or less opaque and granular.

In the dorsal and lumbar regions, with the exception of the hæmorrhages, the preceding observations would apply to the latter also, where similar atrophic changes were found in the cells of the vesicular column of L. Clarke; the anterior nerve-roots being natural, whilst the posterior showed merely some thickening of their lamellar sheaths.*

(*b.*) *Changes in the portion of Skin occupied by the Eruption.*

In the tuberculated form I stated that there exists no anatomical difference between the tuberculated eruption and the tubercle proper. It will now be seen how the latter eruption differs in its microscopical anatomy from the anæsthetic spot, with regard to which (if I except Neumann), I have not come across any satisfactory account in the works of the various authors I have consulted. Anæsthesia being the great distinguishing feature of the eruption, as may naturally be expected, some of the cutaneous nerves of the diseased integument have been found by Danielssen, Boeck, and others, to have been affected by the leprous deposit. This condition of the nerves will account for the pathological changes about to be described; the anæsthesia is thus sufficiently accounted for, and the suspension of the functions of the

* See also case by G. H. Piffard, at the New York Academy of Medicine, January, 1881.

sweat-glands, followed by their destruction, may be also thus explained.*

The following report by Mr. Abraham is on Case XIX. Plate VI., p. 77: an anæsthetic spot, excised from Peter M——. (Hardened in mixture of ⅛% chromic acid and alcohol; sections singly and doubly stained with picrocarmine and hæmatoxylin.)

Slide 117A.—The epidermis is irregular in outline, and varies in thickness; the corneous layer is much altered, with the cells often swollen, pigmented, and with a tendency to desquamation. The deeper cells of the malpighian stratum are, as a rule, copiously pigmented, and the interpapillary processes are very irregular and sometimes wanting.

The underlying layer of the corium shows irregular-shaped, pigmented corpuscles scattered or in scanty groups; some of them can be hardly distinguished from the deep cells of the neighbouring malpighian layer. The general structure of this part of the true skin is that of a dense, fibro-connection, with the cellular elements not very well marked, except in certain positions, along the course of vessels, and probably of obliterated ducts and follicles (Fig. E, a). The cells which are thus agglomerated are for the most part irregular in size and shape, and nucleated; and in a few spots they appear in rather more diffuse and extended groups, without evident relation to other structures. The fibrous elements which principally make up this portion of the corium are in small and much cut up bundles, which lie in various directions. Between the bundles is generally to be made out a somewhat faint granular sprinkling. The lumens of no vessels are anywhere to be seen, and all other structures are lost in what may be considered the general fibroid degeneration.

This layer passes into the deeper principal mass of the corium, where the degeneration has comparatively become still more complete, and where the substance is almost entirely composed of wavy bands of tissue interlacing and winding in all directions (Fig. F). These bands vary in size, and many of them are large

* Sweat Glands in Leprosy, *Trans. Path. Soc.*, 1879, by George Hoggan, M.B.

and homogeneous, or apparently structureless in texture; but some of them are longitudinally striated, and the cross sections of others sometimes show their original fibrillar formation. They are separated by numerous narrow spaces, in which now and then are to be seen faint nuclei. The remains of vessels, ducts, &c., occur at very rare intervals throughout the mass; and these are always at once indicated by a small-celled growth, sparsely congregated at the spot, and following the course of the vessel or duct.

The skin is in this manner largely altered, and similar changes appear to have taken possession of the subcutaneous connective tissue, in which the remains of sweat glands are occasionally present, but nowhere, in this specimen, is there any development of adipose tissue.

The degenerative process invading the sudoriparous glands seems to be also more of a fibroid nature, and it is most marked near to the boundary of the convoluted gland-mass. Often, one or two of the tubes, or a duct more centrally placed, show no diminution of calibre, and a lumen quite distinct. The lining cells, however, are generally changed from their normal appearance, sometimes seeming more granular, or, perhaps, rather resembling the smaller irregular-shaped cellular elements which are elsewhere present. In one case, where the atrophy of the glands is but slight, there is a copious small-celled growth around and between the tubes of the gland, and the greatly enlarged lumen of some of the tubes is occupied by a granular mass. In the case of this gland also, a few fat-cells are present in its substance.

In the preparations of this spot hairs are not numerous. In one case, a dense mass of irregular granular cells, with darkly-stained nuclei, is occupying the wall, and the tissue outside of the follicle; and a sebaceous gland, with the secreting epithelium much degenerated, is also here present. In another, a portion of a hair-shaft, very slightly pigmented, is seen *in situ* deep in the follicle; and in some other sections, hairs, very slender, and with the same sparse pigmentation, occur at intervals.

Slide 118.—In the sections taken from an anæsthetic spot of a leper, eleven months diseased, the appearances are very much as in the foregoing. The degeneration is, however, on the whole, less complete, and the cellular elements are everywhere in greater quantity. Similar changes are evident in the glands and hair follicles, and the same massing in their walls and around them, of irregular cells. The before-mentioned granular sprinkling is also to be made out, occupying interfibrous spaces in some parts. The cross sections of several of the *erectores pili* (Fig. G) are met with, showing commencing granular and other changes, with encroachment into their sheaths and between their muscle-fibre bundles, of the same irregular cells, of which some, besides being nucleated, are studded with dark granules. In one or two spots, also, are to be seen yellowish irregular masses, distinct from the above, and apparently extending in between the muscle cells. In addition, the cross sections of one or two nerve trunks are observable, showing alterations similar to those previously described in the main nerve trunks of the anæsthetic limb.

The sections which have been examined, taken from spots from an anæsthetic arm (that of Mustoo, five years diseased with non-tuberculated lepra), and from a leg, have given evidence in all cases of similar pathological conditions.

(*c.*) *Changes in the Bones.*

The principal changes, due either to necrosis and caries, or interstitial absorption, are met with in the bones of the hands and feet, and sometimes in the long bones of the upper and lower extremities. All these processes are, without doubt, due solely to the diseased condition of the nerves,* and the former process, I am not aware, differs from ordinary necrosis except as to its

* Charcot ("Diseases of the Nervous System," translated by Dr. Sigerson, p. 21) states, referring to nerve alterations in leprosy:—"These alterations give rise at the outset to symptoms of hyperæsthesia. We find in these circumstances almost the whole series of the trophical lesions which we have already described:—(*a*) pemphigus, as pemphigus leprosus; (*b*) glossy skin; (*c*) muscular atrophy; (*d*) periostisis, and finally

primary cause. With regard to the interstitial absorption of the bones, the latter will be found thinner, porous, and furrowed. Plate XVI. is a representation of the bones of the hand and forearm as they are affected in this disease; the patient to whom they belonged was diseased for fifteen years with nerve-lepra, and they have been drawn two-thirds the natural size. Some of the bones, it will be seen, have undergone evident absorption in their shafts, and others of the phalanges have necrosed, and only the tip remains.

With reference to the microscopical anatomy of this part of the subject, the following is Mr. Abraham's description of a cross-section of the tip of a little finger, the external condition of which is shown in Plate VII. p. 80.

The last joint of the little finger from an anæsthetic arm (Mustoo) was excised, and sections, doubly stained, examined under powers up to 600 diameters. The epidermis is in all parts much hypertrophied, and its differentation into layers is distinct: the *strata corneum* and *lucidum* being coloured yellow, and the rest carmine. All the cells are, more or less, but generally very slightly, pigmented, and in some places those in the middle layer show distinctly their "prickle processes." In parts, also, there is considerable alteration, enlargement, and degeneration of individual or groups of cells. Now and then, a local but a uniform granulation (? pigmentary), occasionally in streaks, appears to pervade the epidermic tissue. The inter-papillary processes are largely but irregularly developed, and sometimes there is a decided encroachment of epithelial cells into the adjacent corium, where they occasionally form groups, irregular prolongations, or even moderately well-formed nests.

The corium and subcutaneous tissue, and their contained

necrosis." Referring to the loss of fingers and toes, this author states:—"Some have attributed these various accidents and mutilations to the effects of the anæsthesia. It should not certainly be regarded as the sole efficient cause, for it is not only proved that this merely facilitates the intervention of extraneous agencies, but also that it can be relegated to a secondary position, and even eliminated altogether."

glands, all show many changes from their normal structure. The fibrous tissue, sometimes degenerated, has very often in its interspaces, irregularly-shaped, or at times ovoid, brownish masses of apparent granules, which may be more or less distinct, and which may in some cases occupy the substance of an enlarged cell. The voluntary muscles are atrophied, and are only seen as bundles of ordinary fibrous tissue ; cross-sections of nerves show very nearly the same alterations as described above for the nerve-trunks, and the remains of a few touch corpuscles, are to be made out with difficulty.* The sudoriparous glands are numerous and large, and have, many of them, the wall of the convoluted tubules and ducts greatly thickened, and hyaline in texture, and the lining epithelium often hyperplasic, and sometimes formed of large, irregular, granular cells. In connection with these altered glands, are commonly to be found brownish, distinct, irregular granular masses (Pl. XXXI. Fig. M), which are often in the substance of the wall (*a*), at other times within the tubule or among the epithelial cells, and sometimes outside, in the surrounding connective tissue. They are similar to those above mentioned.

The arteries generally have their walls thickened, and in some cases there is a cellular infiltration, especially just outside the *intima*, which may show signs of endarteritis. The lumens of some of the vessels are partly occupied with a fibrous coagulum holding blood corpuscles and larger irregular cells. The bone and articular cartilages of the finger are undergoing very evident caries, the tissue around and within the trabeculæ being copiously infiltrated with a cellular growth ; and a row of giant-cells (Plate XXI. Fig. N), fitting into "Howship's lacunæ," is seen apparently eroding the osseous substance from the outside.

(*d.*) *The Viscera.*

With regard to the viscera, I have not come across any specific

* The material not having been properly prepared for their examination, the changes in these cannot be here described.

lesions in the internal organs in this form of leprosy, and it is not stated by other writers that any such are met with in pure non-tuberculated or nerve-lepra.

The muco-enteritis referred to as frequently causing a fatal termination seems peculiar to leprosy, for I have not met with similar ulcers in other diseases as are to be found after death in the long axis of the descending colon. I have not been able satisfactorily to ascertain the condition of the ganglia of Meissner under these circumstances, and there are wide and intensely interesting fields here for further study and research both for the pathologist and histologist.

CHAPTER III.

Mixed-Tuberculated Lepra.

A short description will suffice for this variety of the leprous disease. From the foregoing descriptions it would appear that the tuberculated and the non-tuberculated frequently run their course to the end as separate and distinct forms and varieties of one common morbid state; so also it will be found that in certain cases the signs and symptoms of both are sometimes, in a modified form, combined in the same patient, constituting what has been termed by writers "Mixed," but to which I apply the term Mixed-tuberculated, tuberculation being necessarily always present and most prominent. On account of these modifications, and some peculiarities pertaining to mixed-tuberculated lepra, it cannot be dealt with in a satisfactory manner except as a separate subject. It has been put forward that, should cases of leprosy live long enough, it would be found one form would invariably run into the other, so that patients having, say, tuberculated would also get non-tuberculated lepra before they die; that, in fact, the mixed form is the only, the real, and final pathological condition of the leprous state. My experience is at variance with this theory; as I have attempted to show, the two former varieties may each run a defined and certain course without necessarily changing into either and becoming "mixed."

Reference is thus made to this subject in Danielssen and Boeck's work:*—"When we have had occasion, and such has frequently been the case, to make autopsies of lepers presenting one form of disease complicated by the other, we have always met with an admixture of the pathological alterations already described as belonging respectively to the tuberculous and anæsthetic forms of leprosy. It has been otherwise when the anæsthetic form has become

* "Spedalskhed," French Translation, p. 320.

changed into the tubercular, and *vice versa* when the first has been displaced by the second ; in these cases our autopsies have revealed the presence of those pathological alterations which belong to the last or supervening form."

The first part of the extract describes my experience at the Guiana Asylum, but neither there, or in India, have the latter observations been borne out by authorities on the subject.

Cases of mixed-tuberculated lepra have for the most part a history of heredity, and it will be found that the one form supervenes on the other, nor have I discovered that the disease invariably commences as any particular form. As a general rule diseased nerves, as well as the eruption of non-tuberculated lepra, will be present, and, after a few months, tuberculation is ushered in with the usual symptoms.

All writers who have had any practical experience mention mixed leprosy. I need only refer to Danielssen and Boeck, in Norway, and Carter, in India. In the Leprosy Report (p. xviii.) we find Mr. Shaw stating :—"The anæsthetic and tubercular forms and varieties are often combined in the same individual, constituting a mixed variety."

Cases of the mixed form have a closer affinity to chronic syphilis than any disease I am acquainted with. In the mixed form destruction of the cartilage of the nose takes place, the cartilaginous septum becomes entirely destroyed, and the nose appears flattened as in Plate XIX. The velum has also been destroyed by ulceration, thus increasing the resemblance to chronic syphilis.

The average age at which these cases were admitted was—males, 22 years ; females, 37 years. The average duration was—among males 5 years, and among females 7 years. About fifty per cent. acknowledged hereditary taint, and with regard to relative frequency, I had on the 31st December, 1878, the following cases under treatment :—

Tuberculated.	Mixed-tuberculated.	Non-tuberculated.
51	34	151

The following were the ages on admission of twenty cases of mixed-tuberculated lepra :—

From birth to 10 years.		11 to 20 years.		21 to 30 years.		31 to 40 years.		41 to 50 years.	
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
2	—	9	—	3	—	5	3	—	—

More than fifty per cent. of the cases occurred in black races. I have frequently noted that when said to be hereditary one parent has had the nerve form and the other the tubercular ; this was so often the case that it has impressed me as being more than a coincidence. The subject, however, will be best understood by the narration of cases illustrative of the affection.

Case XXXV.—*Mixed Tuberculated Lepra.*

Frederick R——, aged 25 years, negro, native of British Guiana ; admitted from Pln., Anna Catharina. His parents were both lepers ; the father with tuberculated, the mother with non-tuberculated, lepra.

The earlier symptoms are not satisfactorily remembered ; about eight years ago a yellow spot was first seen on each nates, which after a time faded. His feet became very tender, and he could not walk well ; after a while this symptom improved, but the spots got brighter, and commenced to spread at their edges. They began to enlarge two and a half years from their first appearance. At the end of three years he was "troubled on and off with fever." This had lasted for about six months, when a reddish spot appeared on the face, which subsequently became tuberculous. With the appearance of the latter he lost sensation in the fingers of both hands. He also experienced a feeling of "stiffness" in the right ankle and knee-joints, which confined him to bed for three days.

Shortly after his admission into the asylum under my predecessor's care, there was "general fever, temperature 102° Fah., with tenderness of the right ankle and knee-joints," on the subsidence

of which many of the tubercles dried up. In 1875, three years after admission, cutaneous sensibility in the feet was at first diminished, then entirely lost. He cut himself one day with a broken bottle, and caused a sore which took five months to heal.

I examined him on May 22, 1878, when the following was his *state* and *condition* :—

There were flattened shining tubercles, and tubercular infiltration on the face and on the back of the hands ; the fingers were swollen and fissured. There was a large solitary tubercle on each shoulder. The left breast was soft, flabby, and enlarged, with elongated nipple; similar changes were commencing in the right one. He had lost all virile power. His body was covered with scabies. On the front of the chest there was a large non-tuberculated patch, and another occupied the space between the shoulder-blades, spreading down the arms to the hands. There were spreading spots on both nates. The glands in the groin were enlarged. The tubercles were devoid of sensibility, and anæsthesia extended from the toes to the knees, and from the fingers to the elbows. The feet were ulcerated, and the first phalanx of the right great toe had dropped off. The ulnar nerves could be felt enlarged.

Case XXXVI.—*Mixed-Tuberculated Lepra.*

(*See* Plate XVII.)

Borman N——, black, aged 16 years, born at Demerara; was never vaccinated; has been for some time under observation. His father and mother were both lepers, but are now dead. The disease, which is of about two years' duration, came on as tuberculated lepra, and with the usual symptoms. As may be seen from the Plate, the face is now one mass of tuberculation. Other parts of the skin of the body have a scaly, shiny appearance, other parts again being mottled. The fingers, hands, and forearms are enlarged and tuberculated. The glands in the groin are enlarged. The hair is intact. There is a hardened and roughened

condition of the skin of the legs and feet. Non-tuberculated spots are coming out on his back, and others on the legs; these spots are decidedly benumbed. The case is somewhat remarkable on account of the extent of tuberculation present for so short a duration. It is commonly noted that when a case is about to become mixed, if it is preceded by the tuberculated form the progress of the latter is more rapid. It has only taken two years to produce the ravages delineated in the case of this poor lad.

CASE XXXVII.—*Detailed Case of Mixed Tuberculated Lepra.*

Orion M——, aged 40 years; black, native of Demerara; married by the chaplain of the Institution to a woman with non-tuberculated lepra of fourteen years' duration. They have had no children; the wife has had no miscarriages. Patient's wife's mother, his aunt, and cousin were lepers. O. M.'s aunt (father's sister) was also a leper.

At fourteen years of age he had the first symptom of the disease; he was then laid up with fever, and spots came out on his cheeks, forehead, and chin, followed by one on the left hip. Some time afterwards tubercles made their appearance, the patient says, like small-pox, which disease he remembers having, but they got bigger, and formed tuberculous lumps over the eye-brows, cheeks, chin, alæ nose, and lobes of ears. Others formed on the back of the hands, dorsum of the feet and toes, but there was not the slightest loss of feeling anywhere, even in the tubercles. Ulcers formed on the feet and legs, but no anæsthesia. The late Dr. Blair, author of the work on yellow fever, treated him with Donovan's solution, under which his general health improved. When this form of disease had lasted about eight years a non-tuberculated patch made its appearance on his back; subsequently bullæ formed, and some of the phalanges necrosed and came away. Prior to the appearance of this patch he was stated to have had an attack of *rheumatism* (?) He also lost a bone of the left great toe, which came away one day in the poultice from the sore underneath the

foot. He lost sensations over the area occupied by the eruption, which was yellowish in colour. He had an attack of yaws which lasted for six months; this was prior to the appearance of leprosy.

Examined March 20, 1877: *State and Condition.*—The ears are dry and shrivelled up. There is the tuberculous puffiness under the eyes, and dark stains where tubercles once were situated. On the old sites of some of the latter there are the characteristic white shining cicatrices where they had ulcerated. There is an ordinary non-tuberculated patch over the right shoulder; the glands in the groins are enlarged. There is a large patch situated where the great sciatic nerve emerges on the right side, along the course of which, down the leg, the patient is anæsthetic. There is also anæsthesia along the internal cutaneous nerve of the left thigh. On the left foot the first phalanx of the great toe is gone, as also the entire little toe. The surrounding parts are anæsthetic. There are no mutilations or cutaneous anæsthesia in the right foot. The little finger of the right hand has lost the first phalanx; the nails are clubbed and pointed, like eagle's talons, and the back of the hand is depressed and anæsthetic. On the other hand, the two first phalanges of the little and ring fingers have disappeared, and the nails are also clubbed. The ulnar nerve may be felt enlarged in different parts, and paralysed along its entire course.

CASE XXXVIII.—*Mixed Tuberculated Lepra, in a Negro, illustrated with Drawings of different stages of the Disease.*

(*See* Plate XVIII.)

Francis J——, aged 20 years, native of Demerara. No reliable family history. First became diseased about seven years ago. From childhood was accustomed to live among lepers. He has had yaws. The disease was ushered in with the usual symptoms; first, an eruption on the face and arms, followed in due course by tuberculation.

He was photographed on April 24, 1877 (see Plate XVIII., Fig. 1), when the following *State and Condition* was noted:—

There are dark shining tubercles on the forehead, chin, cheeks, nose, lips, ears, and mammæ, the nipples of which are enlarged ; also on the front and back of both arms, and there are fissures over parts of motion—*e.g.*, the elbows, &c. The fingers are œdematous, blistered, and discharging bloody serum, but not otherwise distorted or mutilated. Some tubercles on the legs are ulcerated, and a large ulcer has taken over the greater part of the right leg. Both feet are swollen, and the toes ulcerated. When the above notes were taken he was placed under treatment ; the ulcerations all healed, and he seemed much better ; but after a time he relapsed, suffered from flying pains in the arms and legs, became debilitated, and an eruption of non-tuberculated patches made their appearance on his back, rapidly followed by the usual changes in nerve-lepra.

On March 3, 1880, he was again photographed, and the appearance he presented three years after the last sitting is shewn in Fig. 2. After this the downward course was very rapid. He was sent to the infirmary with extensive ulcerations, having lost several joints of the fingers and toes : he died shortly after from chronic muco-enteritis.

Case XXXIX.—*Mixed Tuberculated Lepra, commencing as Non-tuberculated.*

Jacob A——, aged 30 years, labourer, from Craig Village, Rio Demerary, where he lived with Michael A. (Case III.), an inmate of the asylum. He has lived in concubinage with nine different women. His family are all healthy ; he has had no children ; was never vaccinated, and has had measles, small-pox, and yaws, prior to the outbreak of leprosy. About four years ago, being then employed as a sugar curer, he experienced attacks of malaise and pain about the joints ; he felt his fingers "burn him," and bullæ formed on their extremities. A patch then appeared on the left hip, a conical sore formed underneath the right foot, and spots appeared on his back, arms, shoulders, face, and abdomen. Before the appearance, however, of the latter, he lost sensation in the

second finger of the left hand, then in the right index finger, then the two other fingers of the right hand. Then all the toes of the right foot dropped off one by one. He next lost sensation in both feet and legs, up to and including the knees. Since his admission here on September 8, 1875, the disease has become tuberculated, and was ushered in by an erythematous patch.

Present State, May 1, 1877.—A well-developed man, 5 feet 8 inches high. There are tubercles on the forehead, cheeks, and lips; the ears thickened and elongated. There are patches of psoriasis about the elbows and knees. There are light-coloured anæsthetic patches on the front of chest, legs, arms, back, and thighs. The first joints of the second finger and thumb of left hand are gone, and the remainder are clubbed and ulcerated. On the right hand the first joint of the index finger has disappeared, the others being clubbed, and the thumb ulcerated along its inner side. There is cutaneous anæsthesia from and including the fingers to both elbow joints. The legs and feet are hypertrophied. The nerves of the forearm may be felt enlarged. The peculiar nasal voice is present. The left breast is enlarged, and feels soft and flabby. The glands in the groins are enlarged. No apparent internal complications; appetite bad.

CASE XL.—*Mixed Tuberculated Lepra in an East Indian.*

Ragoo, from the hill districts of Calcutta, arrived in Demerara seven years ago, and was indentured to Pln. Bailie's Hope, E.C. His father and mother died when he was a boy. He was a strong healthy man when he arrived here. He believes he contracted the disease from intercourse with one or two lepers that were on the estate. There was an interval of two years between the appearance of the non-tuberculated spots and the tubercular eruption. The former appeared on the arm, "where the rheumatic (?) pains were worst"—and he soon after lost sensation in the little finger and inner side of forearm.

Present State, March 30, 1877.—There is one large non-tuber-

culated patch extending from the base of the neck over the shoulder-blades. There is another where his babba is tied. There are some on both nates, legs, and front of chest. There are tubercles on the face, enlarged glands in the groins; the feet are œdematous and the toes ulcerated. The skin has the peculiar shining leprous condition. All the fingers are tuberculous and anæsthetic; in the right arm the anæsthesia extending to the elbow joint, and in the left, to four inches above the latter. The spots are anæsthetic in their centres.

CASE XLI.—*Advanced Mixed Tuberculated Lepra in an African.*

Robert B——, aged 43 years, has since died from the exhaustion consequent on the prolonged discharge from ulcerated surfaces and tubercles finally obstructing the wind-pipe. The disease commenced in the usual way as tuberculated lepra. The appearance of the head, face, and chest from extensive tuberculation was very characteristic. There were also tubercles on the limbs; the fingers were ulcerated and contracted, and necrosis of bone had taken place. The legs were ulcerated to a frightful degree, and he had lost nearly all his toes. The glands in the groins were enlarged, forming a tumour the size of a small pumpkin. On the right side anæsthesia had extended to the shoulders, and, on the left, as high as the elbow. Both feet and legs were anæsthetic to the knee joints.

CASE XLII.—*Mixed Tuberculated Lepra.*

Nathaniel T——, aged 14, native of British Guiana. His mother's brother was a leper and died in this Institution. Nathaniel lived with this uncle; his own parents were said to have been healthy. About nine years ago he contracted leprosy; there were at that time tubercles, but neither non-tuberculated spots or joint disease. He was sent to Kaow Island, and treated by the late Dr. Beauperthuy, but derived no benefit, and he was admitted here on August 24, 1876.

Present State, March 26, 1877.—He is a coloured lad, looking ten years older than he really is; his naturally broad mouth is rendered more hideous by the tuberculous lips, the lower jaw protruding like an ape's. There are tubercles on the cheeks, forehead, chin, and ears. There is a large scar on the right shoulder attributed to the frictions with cashew-nut oil. The arms are scaly; the belly scaly and tumid; there are several patches of psoriasis and scabies over parts of his body. His fingers are œdematous, blistered, fissured, discharging bloody serum, and permanently flexed. There are ulcers on the heel and toes of the left foot. A characteristic leprous ulcer is under the right heel.

On the left side he is anæsthetic from the fingers to the elbow joint; on the right the anæsthesia extending as far as the shoulder. Both ulnar nerves much enlarged at the elbow. Both feet and legs are anæsthetic as far as the knees. There are ulcerating tubercles in the throat, and he has the leper croak. The bones of the nose have necrosed; the glands in the groins are enlarged.

Case XLIII.—*Mixed Tuberculated Lepra in a Chinese, simulating Chronic Syphilis.*

(*See* Plate XIX., from photograph taken on February 23, 1880.)

Chan Chow Wing, Chinese, admitted from the Island of Wakenaam; ten years diseased. Non-tuberculated lepra first made its appearance. The condition of the hands may be seen from the plate; the first and second fingers of the left hand are swollen; the parts were subsequently incised, and necrosed bone came away. He has lost part of the right little finger. There is partial paralysis of the face, ectropion, and conjunctivitis. The bones of the nose have necrosed, and the bridge has fallen in. Six months ago, after the usual prodromata, a purplish-red spot appeared on the abdomen, which afterwards faded away, but was followed by a recurrence of the prodromata, and several other similar spots on the back, the arms, and forearms. He is covered

all over with tubercular infiltration and minute tubercles, which would require to be carefully diagnosed from syphilis, *but there is at present anæsthesia, which is not the case in the latter affection.*

CASE XLIV.—*Mixed Tuberculated Leper, commencing as tuberculated.*

Robert L——, negro, aged 25 years. Parents said to have died free from leprous taint. Five years ago he was healthy, but he lived with several friends who were unmistakeably lepers. He had feverish symptoms for some days: felt ill and drowsy; subsequently he noticed his face "red and puffy." After a time his face became covered with "bumps." The symptoms at this time were relieved by decoctions of white cedar bark, a powerful purgative, but the disease continued to progress notwithstanding. Two years afterwards he got "rheumatic-like pains" in his feet and legs; an excavated ulcer formed underneath the meta-tarsal joint of the little toe, and a yellowish spot appeared on the left hip, and one on the right side of the neck, which became benumbed in their centres. His fingers also became numb; when grasping any object it would unknowingly fall out of his hand.

State and Condition, March 31, 1877.—There is extensive shining tuberculous infiltration on both cheeks and forehead, and ulceration on the left ear where a tubercle was situated. There are four yellowish patches the size of a crown piece on the front of chest, and the mammæ are enlarged.

On the left side there is anæsthesia of the palm and under surface of the fingers. On the back part the loss of sensibility extends to the elbow. There are numerous scars where the fire has burnt him. The little and ring finger are contracted, the thumb ulcerated and contracted, and the first finger is claw-like. On the right side the first joints of the fingers have dropped off, the anæsthesia the same as on the opposite limb; the other fingers are permanently flexed and atrophied. There is one yellow spot on the right hip, but hardly anæsthetic except in the centre,

perhaps, but the right leg has lost cutaneous sensibility for four inches above the ankle joint. The feet are swollen, and there are white scars where bullæ had burst. There is a leprous ulcer underneath the great toe. There is anæsthesia in the left leg and foot, two inches above the ankle. There are enlarged glands in the groins. This man died shortly after, when the nerves of the leg and arm were found extensively diseased.

Case XLV.—*Mixed Tuberculated Lepra, probably contracted through cohabitation.*

Hong a Pan, male Chinese, aged 32, admitted on May 15, 1878. Came to Demerara quite healthy thirteen years ago. He was indentured to Pln. Henrietta, Leguan, when the author practised in that place. On an adjoining estate, Pln. Success, there lived a coolie woman who had leprosy, and she and Hong a Pan cohabited. When living with the woman he had an ulcer on his leg (this was in 1875), which partly healed under treatment, but broke out again, and remained open for months. Another sore broke out on the dorsum of the same foot, which also became chronic. He suffered from "pains in the bones," and finally lost sensation over the course of the larger cutaneous nerves. Eight months after the commencement of the cohabitation, the sores being still open, spots appeared on the abdomen, chest, and face, and a sore formed on the dorsum of the left foot, accompanied with a degree of anæsthesia.

Examined Day of Admission.—The cicatrices of the ulcers, surrounded with dark coloured discolourations, are there, and there is anæsthesia to the cutis vera. There are symmetrical spots on the front and back of thorax, and abdomen; those on the latter are a shade lighter than the natural skin, and somewhat oval in shape—the longest, three inches in diameter, the smallest, half-an-inch. There are no raised edges, no glistening surfaces, no serpiginous tendency; they are barely discernible on his light yellow back, *but they are benumbed all over;* those on the back are somewhat

larger, of a deeper tint, and not so anæsthetic; they are more like stainings.

On the face are quite different spots, or, more correctly speaking, one large patch involving both cheeks, bridge of nose, and chin. These are light mahogany-coloured, raised above the skin, and from the surrounding œdema there is evidently deposit connected with them, but no anæsthesia. The lobes of the ears enlarged.

The following notes were taken on April 19, 1880, with regard to this case :—

Dark mahogany-coloured tubercular infiltration of the face, with here and there a few clear-looking solitary tubercles, varying in size from a pea to a marble. There is now a mottled state of the skin on the back, with some petechiæ-like spots, masking the few patches of non-tuberculated lepra. The abdomen is studded over with dark raised masses of tuberculated infiltration, amid which the former spots are almost lost to view. There is marked anæsthesia of the forearms. The legs are swollen, scabby, and ulcerated; the toes are also swollen, red, and blistered-looking. Necrosis of some of the phalanges is taking place.

CASE XLVI.—*Mixed Tuberculated Lepra, with Febrile Exacerbation. Notes taken in the Asylum Case Book, December* 22, 1879.

(*See* Plate XX.)

Chin a Thoi, Chinese, aged 37 years, an inmate of the asylum for eight years. For the past two days he has had fever, which to-day subsided on the appearance of angry-looking raised purplish-red patches on face and neck, a large one on the front of the chest, and smaller ones on the front and sides of the abdomen; also one extensive patch between the shoulder-blades, extending up to the back of the head, and some small ones on the back of the forearms. His lip is enlarged at the outer side by a tuberculous mass, not unlike a nævus.

December 24, 1879.—Patches fading; no fever.

December 29, 1879.—Eruption and fever disappeared; dark thickened stains remain.*

The following embodies particulars of a case of mixed tuberculated lepra, on which I was called on to report to the Government:—

Special Report on the Leper Immigrant Jugernauth, No. 234, ex *Newcastle*, 1880, forwarded from the Immigration Depot to the General Leper Asylum on May 27, 1880. From the patient's statements it appeared he came from Bhopaul, India. Eight to twelve months ago he felt shooting sticking pains along both legs, and lost some degree of sensation in the legs, feet, hands, and arms. He then went to the Depot at Calcutta, where he remained one month, and whilst there experienced the same kind of pain in arms and hands, particularly the right thumb. He got worse, and embarked on board ship for Demerara. Whilst on board he had scabies, and he states, the skin of the extremities "*changed colour*." When landed in Georgetown he had fever or feverishness, pains, heaviness, &c., and his face began to swell. He has one brother and two sisters alive and well. His parents are free from leprous taint. In Bhopaul he was on very intimate terms with a leper named Bugman, who lives by himself in that place. The earliest symptoms he can remember is that about two years ago he felt his fingers burn him "*as if rubbed with pepper*." On board ship he sweated a great deal.

State and condition on May 27, 1880.—Well-developed light brown coolie about 30 years of age.

Head and face.—There is slight tubercular infiltration under both eyes, and on the lobes of ears. The face generally and ears are puffy, and these parts are of a *redder* hue than the surrounding parts. On the left side of the neck is a slightly different colour of the skin, which encroaches on the left shoulder, and ending an inch above the ear. This patch is decidedly anæsthetic; the right side of the neck is sound. On the left side of the chest is another anæsthetic patch. Both forearms and hands are discoloured, and cutaneous sensibility is absent in these parts. Both ulnar nerves may be felt at the bend of the elbow enlarged and *rolling about* under the finger; he felt the left nerve slightly when I pressed it, but not the right.

On the front of the chest there is a large circular leper patch, anæsthetic, bounded by the nipples and umbilicus. There are places on the back which are lighter in colour than the natural skin where cutaneous sensibility is diminished. A patch of scabies surrounds the body where the babba or loin cloth is tied. The glands in the left groin are enlarged. On the left leg, thigh, and foot, except a portion including each great toe and portion of dorsum of foot, the skin is of a lighter colour, and cutaneous sensibility is lost; on the other parts mentioned the skin is of a natural colour, and there is no anæsthesia. On the right side cutaneous sensibility is diminished from the toes to the thigh, and the skin is similarly

* This is the third attack of a similar kind this man had. The others lasted for nearly a fortnight.

discoloured, with the exception of a hand's-breadth below the knee-joint. The tongue is pale, flabby, and fissured longitudinally, and tubercles are about to appear.

I gave it as my opinion, that the case was one of mixed tuberculated lepra, which, I stated further, was peculiar on account of the diseased portions of integument being of so slightly different a colour, merely a shade or so lighter than the natural skin, and doubtless for this reason escaped observation in Calcutta, or he would probably not have been embarked as a sound emigrant, the regulations concerning whom are necessarily very strict.

Case XLIX.—*Non-tuberculated Lepra changing into Tuberculated.*

Henry S——, aged 17, has had non-tuberculated lepra for two years.

May 12, 1880.—H. S., admitted this morning into the infirmary with an eruption, red and raised, angry, greasy-looking, partly circular, with sound patches of skin in the centre. This came on with fever, swelling of the face, evidently sympathizing with the patches on the right cheek and left ear, which appear uniformly enlarged and thickened; water running from the eyes. The other patches are on the left side, and on the nates. There is thirst; increased excretion of urea. Pulse 108; temperature 102·2° Fah.

He was ordered vapour baths, salines and diaphoretics.

May 14.—Pyrexia less; colour fading from the spots.

May 24.—Eruption has subsided, leaving characteristic stains, slightly raised, and here and there roughened to the touch. Patient discharged from the Infirmary. The next stage in this case will be the appearance of tubercles.

CHAPTER IV.

Etiology.

Part I.—*Production of Leprosy: Supposed Causes.*

In studying the etiology of leprosy I have endeavoured to keep in mind the advice of that renowned dermatologist the late Dr. Tilbury Fox to distinguish between the "production" and "propagation" of the leprous disease. That leprosy has been imported into the West Indies can be easily proved; how the disease may be "produced" is still occupying the minds of observers in different parts of the world, and not without some valuable results.

The following are some of the theories that have been brought forward concerning the first part of this subject:—

(*a*) *Theory of a primary dyscrasia,* as maintained by Danielssen and Boeck.

(*b*) *Theory of a developmental tissue defect,* brought forward by Vandyke Carter, M.D.

(*c*) *Parasitic theory,* advanced by G. A. Hansen.

(*d*) *Influence of climate, soil, race, malaria.*

(*e*) *Influence of diet.*

(*f*) *Influence of unfavourable hygienic surroundings.*

(*g*) *Influence of syphilis, yaws, and other diseases.*

Danielssen, Boeck, Hoegh, Conradi, and Bidenkop considered leprosy "hereditary," but "not specific;" Hjost, that it was "not specific" and "not hereditary;" Hohnsen, that it was "specific, miasmatic, and not hereditary;" Lochman, that it was "specific, contagious, and hereditary." (Hansen.)

It will be necessary to glance briefly at these theories put forward as they are by men whose position and attainments entitle their

opinion to so much respect, although Dr. Carter* considered only the following as worthy of notice—viz. :—"An inherited predisposition, contagion and inoculation, and endemic influences."

(*a*) *Theory of a Primary Dyscrasia.*

This theory was propounded by Danielssen and Boeck, in their great Norwegian work, but their views have been since modified. These authors were the first to analyse the blood of lepers, the morbid alterations of which fluid, as already stated, were found to consist of "excess of albumen and fibrine," which "precede and cause the prodromal symptoms."† They found that on the appearance of tuberculation the patient felt better, and the blood was then found to be nearly normal. They also refer to the products themselves being at first fibrinous rather than albuminous; when albumen predominated the tubercles increased in size. In nerve lepra the albuminous effusion in the bullæ was relied on as proving or supporting their theory, to which, however, it might be replied, that every serous effusion is more or less albuminous. I have referred to the disease remaining stationary when the patient is anæmic, and to the progress made when the anæmic condition has been improved. That there is an excess of albumen and fibrine in the blood of tuberculated cases I think has been demonstrated, but whether the so-called dyscrasia is primary or secondary is not yet settled, and all that can at present be said is that the excess of these constituents is a concomitant symptom merely of tuberculated lepra.

(*b*) *Theory of a Developmental Tissue Defect.*

Dr. Carter propounded his views in a communication which first appeared in the periodical mentioned below, wherein he states, "The proximate causes of leprosy appear to consist in a faulty condition of certain tissues of the integument—a defect,

* *Loc. cit.*, p. 178.

† The theory of a primary dyscrasia has been critically examined and satisfactorily disposed of by Dr. H. V. Carter, in the 56th vol. "Med. Chir. Trans.," Feb., 1873, according to whom, "The existence of a primary dyscrasia or blood change seems hypothetical and even needless."

perhaps, of development, certainly a quality transmissible to offspring." This theory has not been favourably entertained by the profession, and Dr. Carter subsequently believed leprosy to be "less a dyscrasia as of a chronic infectious character," and, with Hansen, is inclined to admit the probability of contagion in leprosy, as will presently appear.

Professor Erasmus Wilson is of opinion that lepra is a blood disease,* and, in this respect, resembles the zymotic affections and syphilis:—"The virus of lepra, operating on the system, gives rise to changes in the blood, which affect chiefly the surface tissues of the body, and the nervous system; in the former causing partial congestions with infiltration, resulting in the production of tubercles and ulcers, and, in the latter, loss of inervation and sensation." Tilbury Fox states:—"The production of this tissue (neoplasma) being the result of some alteration of the general nutrition."

(*c*) *Parasitic Theory.*

The parasitic theory of leprosy was advocated first by Dr. G. A. Hansen, of Bergen, in the *Nodiskt Medicinskt Arkiv*, Band i. No. 13, 1869, and Band ii. No. 16, 1870. There is a paper on the same subject by Hansen in the first vol. *Med. Chir. Rev.* for 1875. His discoveries related to the presence of Bacterii or Micrococci wherever the leprous deposits were found.

At page 489, in the article alluded to, Hansen thus makes reference to the finding of these organisms:—"There are to be found in every leprous tubercle extirpated from a living individual, small staff-like bodies, much resembling bacteria, lying within their cells; not in all, but in many of them. Though unable to discover any difference between these bodies and true bacteria, I will not venture to declare them to be actually identical. Further, while it seems evident that these low forms of organic life engender some of the most acute infectious diseases, the attributing of the origin of such a chronic disease as leprosy to the apparently same matter

* "Cutaneous Medicine," p. 377.

must, of course, be attended with still greater doubt. It is worthy of notice, however, that the large brown elements found in all leprous proliferations in advanced stages . . . . bear a striking likeness to bacteria in certain states of development, as these are represented by Klebs; and further, that in almost every preparation from a leprous tubercle, made with the utmost care to avoid contamination, and kept for a number of days in the damp chamber, are developed conglobate masses of spherical bacteria or zooglœa."

Carter thus refers to the subject (p. 169): "The chief distinctive features of the view in question are the following—The leprous disease is essentially an implanted one, and derived from without; its structural elements are at first located in the skin or adjoining surfaces, and afterwards reach the blood or 'system,' whence arise a series of 'constitutional' symptoms, so-called. Here, in fact, is a specific malady, which, though of a chronic character, is yet of 'parasitic' nature; and it is almost a necessary corollary that it should be, as well, of infectious property. . . . . A peculiar class of structural elements is found in all parts which are the seat of true leprous change. The bodies in question have the form of rounded masses or collections which closely resemble the so-called bacteria, or micrococcus—colonies, now so well known in medicine; and they exist not only in the skin (in tubercle or eruption), but in the nerves, in clusters of lymphatic glands, both superficial and deep, and even in the spleen, the liver, testes, &c., and the corresponding deep-seated lymphatic glands." At p. 301, vol. xxvii. "Trans. Path. Soc.," London, Carter thus further alludes to the examination of a recent specimen of leprous tissue:—"After the addition of acetic acid, with magnifying powers of 500 diameters, the following pathological appearances belonging to the circumferential part of the leprous growth were seen—(*a*) copious cell production of the usual character; (*b*) numerous large, granular, pigmented masses; (*c*) streaks of orange-tinted granules; (*d*) numerous collections of aggregated spherules, in visible characters identical with the well-known *micrococcus masses* or *zooglœa*."

Since the foregoing was written the following letter from G. Thin, M.D., appeared in the *Lancet* of November 27, 1880 (p. 878):—

"The observations of Hansen (Virchow's *Archiv*, vol. lxxix. 1880) on the Bacillus lepræ cannot fail to direct enquirers into a new field of study in reference to this disease. Through the kindness of Mr. Watson Cheyne I have had an opportunity of examining sections through lepra nodules lent him by Dr. Koch. The presence in large numbers of the minute organisms described by Hansen, distinct when examined under favourable circumstances, but not so easy of observation as many of the forms of bacteria, whatever their precise relation to the primary cause of the disease may be, can hardly fail to have an important influence on its development."

I have been favoured by the author, Dr. Albert Neisser, of the University of Leipsig, with a copy of his paper, "A Further Contribution to the Etiology of Leprosy,"* which appeared in Virchow's *Archiv*, from which I have obtained the following most interesting particulars bearing on this important subject. Dr. Neisser's investigations, which relate to the discovery of the bacillus leprosus, were carried out in the autumn and winter of 1880, at a special hospital at San Lazaro, Grenada, on twenty-one cases of leprosy which were there placed at his disposal. In his preliminary remarks he refers Hansen and Kleb to his former paper in the *Breslau Medical Journal*, Nos. 20, 21, 1879, where he disclaims any priority in this discovery, but claims to have secured for these micro-organisms their proper place among the pathogenetic fungi, and being the first to apply the new method of staining of Weigert and Koch for their demonstration.

In all the pathological products, Neisser found the one, single determined species of Bacillus lepræ. Such organisms were found in the new formation of the skin, the mucous membrane of the mouth, palate, and larynx; in the interstitial processes of the peripheral nerves, the cornea, cartilage, and testicle; also in the lymphatic glands, the spleen, and liver. They were absent in the

* "Weitere Beiträge zur Ætiologie der Lepra:" Virchow's *Archiv*, Bd. lxxxiv. taf. 12.

spinal cord and muscles, and also in the bullæ and the affections of the bones—changes which cannot be regarded as primary, but rather as secondary to the nerve lesions ("perhaps trophical changes"). In the skin the bacilli were found in the circumscribed tubercle, and in the more diffused infiltration, and were everywhere situated in the large round lepra cells described by Virchow, equally diffused, and filling the entire protoplasm of the cells, or collected into groups, altering the size of the cell and requiring a very accurate investigation to determine their nature.

The bacilli were very slender rods, straight or slightly curved, and sometimes small granules were found instead of bacilli. Active movements were observed in those obtained from the juice of a tubercle and in the pus from the ulcers. In section II. (pp 524–526) Neisser describes the processes of staining he resorted to. Fuchsin surpassed all other substances, but the colour the bacterii assume was less intense than that of micrococci. Bismarck brown and all the other brown staining materials were useless, and eosin failed to stain the individual bacilli. Most of the preparations lose their colour after a few days, but the author possesses preparations which have been nearly two years in a good state of preservation. In addition to the smooth bacilli, Neisser describes two other forms he met with, both of which were mobile. No bacilli could be found in the blood, but their arrangement corresponded to the smaller blood-vessels and lymph-vessels which were surrounded with cell collections. The bacilli presented identical characters in cases from Norway, Spain, Guiana, East Indies, Roumania, Brazil, and Palestine. In section IV. Neisser states that the histological investigations would lead him to conclude that the specific form of Virchow's lepra cell depends on the specific bacillus, and their appearance in the latter coincides with the development of these from migratory cells into connective tissue elements. In the last-named section are also described some interesting experiments on animals in which leprous matter was inoculated. Those on the rabbit were not attended with any result, the large cells containing

bacilli quickly perishing when introduced; whilst in dogs the inoculation was straightway followed by the leprous new formations. On the 16th of October, 1880, a dog was inoculated, and killed on the 6th of January following. Whilst he was alive you could feel a nodule under the scar of the incision which increased in size; this tumour when microscopically examined was found to consist of leprous cells containing numerous bacilli. Neisser observes that whilst in man leprosy becomes a constitutional disease, in animals only a local leprosy was produced, although he is of opinion that general leprosy may yet be propagated in the dog.

The preceding is a short and imperfect account of a most valuable series of experiments which go to prove that leprosy is essentially a contagious disease, and that the disease is propagated by means of its specific products, so that our observations in the future might profitably be directed in the channel so ably pointed out by the author of this paper.

In the Société de Biologie* Gaucher brought forward this subject ("Parasitisme de la Lèpre"), and states he had observed in some blood taken from a leprous tubercle a large quantity of mobile bacterii. There can be very little doubt but that the granular masses figured in Plate XXI. are identical in character, but owing to the mode of preparation could not be more distinctly made out.

(*d*) *Climate, Soil, Race, Malaria.*

The observations with reference to the influence of climate, soil, race, and malaria, in the production of leprosy, may be conveniently arranged under one heading. It may be gathered from a geographical sketch of the disease how little value can be attached to either of the foregoing as a primary cause in its production, leprosy being found in "tropical, sub-tropical, mild and cold climates, from the Poles to the Equator" (Liveing); in malarial climates, and those of temperate non-malarial zones. That this affection is so common in malarial countries may be explained by the

* "Le Progrès Medicale." Dec. 18, 1880, p. 1038.

fact of malarial influences injuring the system, reducing the vital powers, and so placing a person in a condition to take on any diseased action should the exciting cause be present to hand. Among those in favour of malaria as a cause of leprosy may be mentioned Holmsen and Cierulf.

With reference to soil and climate, similar exceptions may be taken, leprosy being prevalent in those the most diverse. It is distributed and equally prevalent throughout the length and breadth of India, where soil materially differs; and it may be found on the banks of the Nile as well as the Orinoco, in mountainous regions as well as marshy plains; according to Davison, in his account of leprosy in Madagascar, "in town and country, at a height of 7,000 feet above the sea level, along the sea line, and through all intermediate elevations."

With reference to climate, some difference exists with regard to the form of the disease prevalent in different countries. Thus, whilst tuberculated lepra is most prevalent in Europe, the non-tuberculated most commonly prevails in South America, the West Indies, and India.

No facts bearing on the subject have been brought forward showing why one form thus preponderates in cold and warm climates, or why cold latitudes should have an excess of cases with the severer form—*e.g.*, Norway, 51 per cent. of tubercular cases to 9 per cent. in Bombay, or 21 per cent. in British Guiana. Dr. Bakewell states ("Correspondence," &c., p. 35), "the cold of England appears to have caused the disease to advance more rapidly than in the West Indies;" and he accounted for this by diminished perspiatiorn. It is an important practical matter whether the good effects of residence in a temperate climate would not more than counterbalance any evil effects that might probably ensue on some diminution of the secretion of the skin.

Influence of Race.

The influence of race has also been alluded to. Leprosy is

decidedly more common among dark than white races, but irrespective of any influence of race, there are many reasons to account for this; the modes and conditions of life are so dissimilar that any comparison drawn must necessarily be on imperfect data. With regard to this country, one important fact is the immunity from leprosy enjoyed by the aboriginal tribes of British Guiana,* whereas it is common among the Bovianders, or the offspring of the Indians with the black or coloured natives of the Colony. This immunity may be due to their open-air life, their habits of cleanliness, isolation, and absence from predisposing causes, but it is not correct to attribute it to "only occasionally eating salt fish, which is the staple food of the negroes."

(*e*) *Influence of Diet.*

Much has been written with reference to the influence of *diet* in the production of leprosy, and, although I do not attach much importance to it as a factor in this respect, an account of the disease would not be complete without some reference to the subject. Bad food will predispose to any constitutional disease, and why not leprosy; but I deny its agency otherwise. Great importance was attributed to diet by the Leprosy Committee, who quoted the opinion of White of Selborne that the disappearance of leprosy from England was mainly owing to "improved agriculture, and an abundant supply of fresh food and vegetables." Dr. Liveing† has shown that the circulation of this opinion has "contributed to exaggerate in the minds of the profession the importance which the Committee of the College attach to diet as a cause of leprosy."

Eating diseased maize or grain was at one time thought to have some connection with this affection. There is prevalent in Lombardy, an old seat of leprosy, a disease, Pellagra, thus caused, which has some points of resemblance to nerve lepra.

With reference more particularly to leprosy in the West Indies, it will be necessary to make some allusion to the dietary of the

* Alluded to by Dr. Gavin Milroy, in "Leprosy in the West Indies," 1873.

† "True Leprosy."

people before deciding on a want of influence in its causation. The food on the whole is unobjectionable. The natives of the East Indies, large numbers of whom annually arrive here, live on rice, flour, various wholesome vegetables and milk, fresh fish, butter, &c. Curry and rice is their daily food; it is made with fish, mutton or fowl, with butter, or oil from the cocoa-nut (*Cocoa nucifera* monogynia hexandria. Their diet cannot certainly be said to be either nourishing or strengthening, they nevertheless appear to thrive on it, and it cannot in any sense be said to cause leprosy.

With regard to the negroes, their favourite food is the plantain (*Musa paradisaica*). "Ten pounds of dry meal may be obtained from a bunch of plantains of 50 lbs. weight, containing 88 per cent. of nitrogen, and 545 per cent. protein compounds."* This is prepared for food in a variety of ways; (1) boiled and eaten plain, with salted fish; (2) when ripe, fried as fritters; (3) pounded into a meal and pap made; (4) pounded into a mass, and eaten with soup, made as follows—French calelue (*Busella cordifolia*), ochros (*Hibiscus esculentus*), tomato (*Solanum lecopersicum*), shrimps, fresh fish, a small quantity of salted fish or beef to flavour, and an onion, are all boiled together with the plantains, the latter are then taken out, pounded, and eaten in the same way as mashed potatoes. Fresh meat, milk, eggs, &c., also enter into their diet, on which the blacks fatten and thrive, and bear primary surgical operations wonderfully well. They also consume large quantities of cane juice, sorrel, and other anti-scorbutic fruits of great value; there is certainly nothing in the diet of the people† to account for

* Rev. Robert Duff's "Account of British Guiana."

† Numerous kinds of peas are also eaten:—Pigeon pea (*Cojarris flavus*), bouavis pea (*Buona vista*), white and blue Indian beans, black-eyed pea, and, by the coolies, dholl or gram.

Edible roots are also used, containing more carbonaceous than nitrogenous constituents:—

Common yam (*Dioscoria sativa*).
Buck yam (*Dioscoria triphylla*).
Dunplar yam (*Dioscoria acubata*).
Red yam (*Dioscoria alata*).
Eddoes:—1. *Arum esculentum.* 2. *Caladium sagitta.* 3. *Cal. macrorhizon.*
Sweet potatoes:—*Batatus edulis, Convolvulus batatus,* containing 2½ per cent. more protein than the common potato.
Cassada:—*Jatropha læfiüngii.*

the presence of leprosy among them. The diet of the upper classes in no important way differs from that of the home countries.

The importance of a fish diet in the production of leprosy has been unduly dwelt upon. I do not attach any importance, as regards the etiology, to the fish-eating propensities of the people, and this theory may now be laid aside as obsolete. For years it has been a favourite one, and among the many causes that have contributed to this predilection may be mentioned the prevalence of leprosy in people who eat fish in a half decomposed state. It is a sufficient answer that leprosy is found where fish is never eaten, as well as in places where it is not for a moment contended that it is used in an unwholesome state. In British Guiana salted fish is used by nearly every person in the community, and the laws against exposing putrid meat for sale are very stringent; when properly prepared salt fish is not an unwholesome article of food. The theory, however, has had the advocacy of such authorities as Dr. Gavin Milroy and Mr. Jonathan Hutchinson, the majority of medical men being of opinion that leprosy may be influenced and promoted by semi-putrid food, but that fish, *per se*, has any influence whatever in the production of the disease is universally denied. In this connection I cannot do better than quote Dr. Liveing,* who has devoted much attention to this subject:—"It must be admitted that the fish theory is much weakened by the fact already mentioned, that the disease exists where this diet is unknown;" and he thus explains how the fish theory comes to be so generally received:—"Fish is the staple animal food of the whole tropical world: what wonder then that we should find it used in leprous countries? I believe it would be quite possible to show that people who suffer, say from tropical remittent fever, are great consumers of fish. While, therefore, I do not believe that fish, as such, has any special influence in promoting this disease, I fully admit that decomposing and unwholesome food of all kinds has a marked effect on the progress of the

* *Loc. cit.*

malady; and further, that as fish is a kind of food very largely used, and at the same time very ready to undergo decomposition, it has acquired an exaggerated reputation as a cause of leprosy."

Now take the "Leprosy Report," and at page 2 we find a list of places given where leprosy is said to be unknown—viz., Nova Scotia, Prince Edward's Island, Turk's Island, British Honduras, Falkland Islands, and some others, where it will hardly be said that fish does not enter into the dietary of the inhabitants.

This subject has recently been brought prominently before the profession by Mr. James Startin, in his interesting "Case of True Eastern Leprosy," published in the *Lancet*, of October 30, 1880 (p. 692), in which the author states: "this case could not be possibly ascribed to the eating of bad fish, for he had none;" and further on—"What can supporters of the fish theory say to the fact that the natives on the border of the great desert of Sahara never eat fish, and yet they get leprosy in its worst forms. And again, the natives of Rawul Pindi, in the Punjaub, in India, and the natives who dwell on the Naga Hills, in Assam, do not eat fish, and yet they get it too. Now the natives, or the 'Nuggs,' who live in Arakan, live on fish, yet leprosy is seldom or ever seen among them. These, and other important facts which I have elicited from reliable sources, completely upset, in my opinion, the theory of the eating of bad fish as the origin of true leprosy."

With reference to this case, Mr. Hutchinson replied, "that he had not seen a single instance of leprosy in which the fish hypothesis was impossible; nor does he know of a single district where the facts, when sifted, are strongly opposed to it;" to which, in continuation of the discussion, Dr. Thin answered (*Lancet*, Nov. 27, 1880, p. 878):—"The hypothesis will, I take it, be possible until it can be shown either that a leper has never eaten fish once in his lifetime, nor that any of his ancestors have done so, or that some other cause of leprosy has been definitely established as the true one." Dr. Thin quoted from his friend, Dr. Arthur Reid, just arrived from China, who also furnishes evidence *contra* the

fish-eating theory. Dr. Reid states:—"Fish eating is essentially in Central China the privilege of the well-to-do, while leprosy is usually found among the poor vegetable feeders." In the same periodical appears this interesting communication from Dr. T. Colcott Fox, "who has studied attentively the etiology of leprosy." He states:—

The main argument, in short, for the causation of leprosy by a fish diet lies in the marked concurrence of the disease with the distribution of water on the earth's surface, and the use of putrid fish as an article of diet in islands, on sea-boards, and, to a less extent, inland. Virchow, indeed, looking to the illustration afforded by Norway, the shores of the Mediterranean, and many islands, thought leprosy "was limited to the borders of seas and large rivers." Hansen (as quoted by Carter), from a more extended survey, which has not led him to adopt the fish theory, has expressed himself thus:—"So far as I know, the sole condition which can with any tolerable certainty be regarded as universally prevalent in all these several localities (both at home and abroad)—*i.e.*, where leprosy is known to prevail—is the vicinity of water, either salt or fresh." In the light of still more recent observations, which are well summarized by Dr. Munro ("Leprosy," 1879), we must considerably modify even this statement; for leprosy is found in many inland and elevated districts and mountainous regions, and far from rivers. "The College of Physicians' Report," p. 189, after stating that no castes are exempt, adds that the Brahmins, and some of the higher castes of Hindoos, in Mysore, eat no kind of flesh, and though the lower castes do when they can get it, fish, fresh or salt, is very rare in Mysore (see also p. 184, "Nagpore"). At page 181, it states that, "the majority of the people being Hindoos they are strict vegetarians;" and again, it repeats that leprosy is largely present among the vegetable-eating Hindoos; and (p. 134) it records that the inhabitants of the notorious leprous district of Bearbhoum are exclusively vegetable eaters (see also Macnamara on "Leprosy," 1866, and Espinet's "Reports from Trinidad," 1873–4). Vandyke Carter, in his "Reports of Leprosy," 1876, speaking of Western India, says that "many lepers have never tasted animal food;" and, as regards the Crujerathi population, "by a majority of the people it may be said that animal food is scrupulously avoided." Again, in his "Modern Indian Leprosy," 1876, Carter says of the diet in the Bhanajar District of Kattiawar, "animal food is very rarely used, only Mussulmans, a few Rajputs and Kolis of lower grade will touch either flesh or fish." The same great authority on leprosy writes ("Report on the Prevalence and Characters of Leprosy in the Bombay Presidency," 1872), at page 14, that "there is no clear evidence that any special article of diet either excites or predisposes to leprosy," and "a very large proportion of the population of Western India are either solely vegetarians, or partake only occasionally of animal food;" and again, at page 37, "true leprosy has absolutely no apparent connection with such diet" (*i.e.*, fish), and "in Western India all castes, except most Brahmins, the Tains and Singaets, may partake of fish" (see also the interesting information collected in the list of castes). Turning to China, I would refer Mr. Hutchinson to the several articles in the *Chinese*

Customs' Gazette, by Drs. Reid and Wong, in support of the latter's statements, that "it does not appear that fish eating plays any part in the causation of the disease."

I bring forward this complete summary as containing the latest information with regard to the fish theory which it is desirable should once and for all be laid aside as having no important part in the causation of leprosy. I have known a colonial government, acting on the advice of the advocates of this theory, refuse to sanction the issue of a wholesome fresh fish ration to the inmates of a leper asylum, manifestly to their disadvantage.

(*f*) *Unfavourable Hygienic Conditions.*

Unfavourable hygienic conditions, although having a most important influence on the disease, once it is developed, may also be eliminated from among the probable causes of leprosy, inasmuch—which is not disputed—that the well-to-do, those otherwise placed, are attacked as well as the poor, the badly housed and nourished.

A consideration of some of the vital statistics* of the Colony will readily show how favourable a chance such a disease has of flourishing when implanted in the midst of a people who neglect the most elementary laws and conditions of health.

During the twenty years, 1841–61, the excess of deaths over births for the whole Colony was 26 per cent., but during the succeeding decade this excess was only 10 per cent. During the last ten years the

Average birth rate = 35 per thousand.
Average death rate = 33 „ „

About 25 per cent. of the mortality comprises children under one year of age, and nearly 40 per cent. of the mortality of children under ten years of age.

The following percentages of children born, die during the year:—

European descent	14 per cent.
Black and coloured descent . . .	18 „
East Indian descent	15 „

* Taken from the excellent Annual Reports of the Registrar General of British Guiana.

Twice as many illegitimate as legitimate children are annually registered. The mortality is greatest among the creole population. Nearly as many die unattended by a medical man as those who have received medical aid in their last illnesses, the blacks being much addicted to native, or "bush" remedies, and quack doctors, and the undrained state of some villages, under water for days together, causes considerable disease and mortality among them. A very different state of matters obtains on the plantations, where the labourers have every comfort and care, and the mortality in many cases is as low as in temperate climates.

Five per cent. of the population are paupers, and 4 per cent. criminal prisoners undergoing punishment.

The following were the principal causes of death, 1869-78, the general population being about 240,000 :—

Principal Cause of Death.	6328 Deaths in 1869	6203 Deaths in 1870	7324 Deaths in 1871	7354 Deaths in 1872	7245 Deaths in 1873	7567 Deaths in 1874	8034 Deaths in 1875	8270 Deaths in 1876	8677 Deaths in 1877	7282 Deaths in 1878
Dysentery and Diarrhœa	1618	1190	1331	1212	1279	1142	1334	1160	1468	1371
Consumption	457	441	506	532	429	473	624	576	609	530
Fevers generally*	31(?)	665	797	661	666	915	914	915	960	676
Convulsions†	406	276	523	552	557	603	639	865	716	535
Dropsy	279	256	408	335	304	350	404	457	355	265
Thrush	109	142	172	163	235	210	226	272	316	280
Pneumonia	98	103	163	181	170	254	223	194	358	248
Bronchitis...	70	87	162	115	132	137	139	212	215	138
Other Diseases of Lungs and Respiratory Organs	80	101	220	376	385	327	290	282	191	134
Tetanus	111	66	100	103	101	89	91	80	100	90
Ulcers	96	103	119	107	143	158	180	136	135	81
Marasmus, Atrophy, &c...	471	480	444	445	539	571	562	455	622	632

(*g*) *Influence of Syphilis, Yaws, &c.*

The following opinion of the Leprosy Committee was based on the answers received to their question (p. 68)—"Have you reason to believe that leprosy is in any way dependent on, or connected with, syphilis, yaws, or any other disease" :—

Leprosy is very generally considered to be a disease *sui generis*, quite independent of, and unconnected with, any other disease. The opinion that leprosy may be excited by the poison of syphilis, or that the two diseases are related to each other,

* Remittent; intermittent; typho-malarial.—J. D. H.

† From ascarides lumbroicoides; or, occurring in the course of remittent fever.

is held by several observers, especially those reporting from India. Dr. Stevenson of Barbadoes also says that "leprosy is most common in children of syphilitic patients." Some venereal tuberculated affections in their outward characters appear to resemble very closely cases of tuberculated leprosy, so that the two diseases are liable to be mistaken the one for the other. The diagnosis will, of course, be more difficult when the two morbid states co-exist in the same patient, as they not unfrequently do in many parts of India and elsewhere. The yaws is a disease which is met with in many countries where leprosy is common. It was formerly very common in several of the West India Islands, but of recent years it has become comparatively rare.

Yaws is still very prevalent in British Guiana. In 1875 I forwarded a special report to the Executive, with a list of eighty-eight cases in the Island of Leguan alone, the population of which did not exceed 3,000.

With reference to the disease of leprosy in connection with syphilis, yaws, &c., there were among the 188 cases so frequently referred to, "134 that were never vaccinated, of which number 65 had small-pox before contracting leprosy; of the total number, 46 had yaws, 15 small-pox and syphilis, 24 small-pox and yaws, and 7 had syphilis and yaws in the order named, before the leprous disease made its appearance." *

Several inmates of the General Leper Asylum have been attacked with yaws during their sojourn in that institution, the latter disease running its usual course, apparently uninfluenced by the leprous malady.

Some writers have thought they could discover a closer affinity between syphilis and leprosy, which resemble each other in so many respects. According to Hebra and Kaposi, during the sixteenth century there was much discussion whether the new and ravaging disease, syphilis, which had made its appearance in the course of the preceding century, as leprosy was declining, was not in reality the offspring—a "daughter" of leprosy; and this view is supported even at the present day. (See Simon, in "Handb. der spec. Path. u. Ther.," v. Virchow, B. ii. pp. 422, 429; and dessen, "Kritische Geschichte der Syphilis, Fochter und wiederun Matter des Aussatzes," Hamburg, 1857.)

* *Loc. cit.*, p. 122.

It is the fact that leprosy had become comparatively rare in 1494, when syphilis broke out, and the close resemblance in many respects between the two affections is very striking. Take, for instance, cases of mixed tuberculated lepra, as delineated in Plate XIX., Case XLIII., where the signs and symptoms might be easily mistaken by the inexperienced for one of advanced venereal. Erasmus Wilson* states that leprosy "resembles the zymotic affections and syphilis," and it also "resembles these diseases in some of its phenomena." At the end of the "Leprosy Report" there is an interesting paper on leprosy by this writer, from which I have already made extracts; at page 231 he states: "In another case, the disease followed syphilis, and was thought to be secondary syphilis; but time discovered its true nature, and further inquiry determined that the source of the syphilitic poison was a leprous woman. And in this case it may be asked, 'Did the leprous taint creep into the blood with the syphilitic poison? or did the syphilitic disease merely act the part of an exciting cause to the leprous diathesis, already engendered by birth and residence in an infected country?'" This may be read with Case III., that of Michael A——, and in both it seems probable that infection from a leprous sore had taken place. Referring to the supposed analogy between leprosy and syphilis, another case, mentioned at the Pathological Society, London (reported in the *Lancet*, January 8, 1880, p. 56), is interesting. It was brought forward by Dr. Ormerod, and was one where, from syphilis it was believed, there was a fusiform enlargement of the median nerve, followed by wasting of the muscles, anæsthesia, and other pathological conditions of the tuberculated lepra. Again, in Fox's "Skin Diseases," page 301, reference is made to a statement of Fournier, a French physician, that he had witnessed in secondary syphilis among women, "anæsthesia," or "analgesia" of the hands and feet.

Dr. Hoegh, of Norway, in 1855 suggested the communicability of the disease through the icarus scabei, and mentions a remark-

* *Loc. cit.*, p. 377.

able case in support of his contention. Large numbers of lepers certainly suffer from itch—in this asylum, as many as 75 per cent. I am inclined, however, to regard this complication more as a coincidence—the penalty paid for the neglect of personal cleanliness.

Dr. Milroy is of opinion that there is an obvious analogy between leprosy and struma; other writers have suggested also scrofula. Leprosy is said to be allied pathologically with syphilis and lupus, but has no relation whatever to scurvy.* Cases of nerve-lepra resemble in some of their symptoms chronic ergotism—*e.g.*, the necrosis of parts that occur in the latter complaint. Reference has already been made to pellagra, in which the erythematous patches, the fissured and discoloured skin, with atrophy of the muscles, have a close resemblance also to the leprous affection.

With reference to the original causes of leprosy, it is necessary to inquire, Does the disease ever occur spontaneously? Carter states (page 127): "In my opinion, leprosy never arises in a spontaneous manner." Milroy, Boeck, and some others, think it may so arise; and Dr. Rees had a case at Guy's Hospital, in 1866, which appeared to have so arisen. The evidence, however, is not conclusive on the point, and I am inclined to think that in the cases brought forward some other influence in all probability had been overlooked.

PART II.—*Some account of the Introduction and Progress of Leprosy in the Colony of British Guiana.*

Of the earliest history of leprosy in this country unfortunately not many records remain, nor is it known with any certainty to what extent the disease prevailed under the Dutch who first held the colony, or at the commencement of English rule. I have come across some "Notes on the West Indies," from the pen of Dr. Pinkhard, Inspector General of His Majesty's Armies and Fleets, who arrived in charge of British troops on the occasion of the

* E. M. Müller regarded leprosy as "*exalted scurvy.*"

capitulation of British Guiana by the Dutch, in 1796. The notes in question only deal incidentally with medical topics, but the remarks on the fevers and other diseases of that time are of great interest to us now. The author refers particularly to the disease of yaws, and mention is likewise made of a case of leucoderma in a negro, but no mention is made of leprosy, which, from other reliable documents, it seems existed in Demerara at that time (1796), and this is confirmed by old residents, who distinctly remember, and have often spoken to me on this subject.

There can, I think, be no doubt that leprosy had been from the earliest days of slavery introduced by the blacks from Africa. Dr. Liveing, in his excellent work on "True Leprosy" (page 37), states: "In Africa, leprosy has existed from time immemorial—in Egypt and Nubia. It is also found on most of the African sea-coasts, and in many inland districts, especially in the vicinity of the great rivers Niger and Congo. . . . . It is certain that leprosy has been largely exported from the eastern to the western hemisphere during the last 300 years; and it is in the highest degree probable that this is the only channel through which the disease has now become endemic over a large part of South America and the West Indies.

I could, if necessary, multiply authorities on the same subject, all the evidence pointing to Africa as the source, and the slaves the medium whereby leprosy was, in the first instance, introduced. As to its extent and prevalence at the time, there is not any difference of opinion. The disease was well known, and very strong opinions held as to its nature, but there were not very many cases. During slave time the cases of leprosy were not only few in number but the disease was more or less stationary; and it was not until after the Emancipation, in 1838, that it commenced to spread throughout the colony. In the "Leprosy Report" (p. 71), it is stated that "prior to the emancipation of the slaves, the leprous poor in the West Indies were kept on the estates to which they belonged," to which, should be added, that any case of leprosy occurring on

a plantation was invariably isolated at the "back-dam"—the furthest boundary of the estate—where a small hut was erected for his sole use, and he was allowed to act as "watchman" for the provision grounds, which were, and still are, situated at the furthest extremity of the estate, away from the rest of the community. The contagion theory was strongly believed in by all colonists, and the merest contact with a leper was avoided. These watchmen would receive money for provisions sold, which, on handing over, they would count and deliver by the point of their cutlass. It is a fact that leprosy did not spread to any extent during slave time—the regulations affecting the sexes were so strict, and the isolation so complete, every means seems to have been adopted to cut off the affected from the healthy.

In 1831 we find leprosy mentioned in the archives of the Colonial Secretary's office at Georgetown, in which year returns were sent in (dated October 22, 1831), purporting to be a "Return of Leprosy *Negroes* in the Essequibo Division of the United Colony of Demerara and Essequibo," containing a total of 431 lepers. Considering how careful they were in those days in anything affecting the health and market value of the slave, this number may fairly be taken to represent the cases of leprosy in the colony at the close of the slavery epoch.

At this time immigration from China, Madeira, and the East Indies had not yet set in, and there are no records of any other race having been affected except the blacks.

On May 1, 1832, the lepers were removed to the mouth of the Pomeroon river. Subsequently, certain communications were read from a Mr. Zimmerman, the Protector of Indians, or Post Holder,* as he was called, at the Court of Policy, relative to the "ruinous condition of the leper establishment," and recommending its removal a mile further, as "the Indians had manifested an inclination to leave the Post." In this despatch the words "leprous negroes"

* The Post Holder was the Government Protector of Indians. Annually, gifts were made by the Government through him to the aborigines.

were used. An Indian station, or "post," had been established at the place the lepers were isolated, the accounts for which were included in those forwarded to the Government for the lepers. In 1839, we find from a report by Inspector-General Crichton, that on his visit there, in May of that year, he found only five lepers, but as he at the same time contracted for the erection of 400 feet of building for their use, the number must have been afterwards considerably augmented. As bearing on the propagation of leprosy, the history of this leper settlement is interesting:—

During the governorship of Sir Benjamin D'Urban, this Indian post at the Pomeroon was in full operation. The Indian tribes there were Caribbees, Accoway, Arrowack, and Warrow. The Protector appointed for them has a representative to this day, who is now a resident magistrate. By the regulations, the Post Holder would have about him twenty-five to thirty Indian men, with their wives and children. Such was the state of affairs when the lepers were sent there, and, according to an official statement of Mr. Stipendiary McClintock, "established in a small village situated on a sand reef, within a few roods of the Post Holder's house and those of the Indians." This proceeding gave great dissatisfaction to the latter. One tribe, however, the Warrows, consented to remain. "These are," says Mr. McClintock, who has lived all his life among them, "the hewers of wood and carriers of water, a race indolent and wretched in their habits and appearance, domestic arrangements, &c., and inferior to the Caribbees and Arrowacks, who look down on them as on inferiors."

The Warrows constantly associated with the lepers, dwelling among them, "remaining several weeks at a time fishing for them, receiving in exchange some of the lepers' rations."* Leprosy afterwards broke out among these Warrows, and is prevalent amongst their descendants to this day. In another official report Mr. McClintock states: "On taking the census of the whole Indian population (1842), which included the settlements on the Lakes

* See Report by Demerara Commission, 1874, p. 30.

Capoey and Tapacooma, those on the rivers Pomeroon, Morucca, Wynie, and Baruma, with their tributaries, although many cases of leprosy of both sexes come under reporters' observation, *every case was confined to the Indians of the Warrow nation.*" The descendants of negroes and Warrows, called Bovianders, may be now met with at the Pomeroon suffering from leprosy.

In 1841 immigration commenced from Madeira. The Portuguese suffered much during acclimatization, but do not appear to have introduced the disease of leprosy into the country. There can be no question, however, that it was introduced by immigrants arriving from China and India,* and I have from old records gathered proofs in support of this statement that cannot be gainsaid. I should first remark that, in 1858, the lepers were removed to the present institution on the Mahaica river.

Lepers arrived in the country by the immigrant ship *Colgraine*, 1842. There are two persons at Pln. Cane Grove, who arrived in this ship with leprosy, as well as the immigrant Jaudhoo, ex *Colgraine* of Pln. Spring Hall. In 1861, Leong Shee, female Chinese, aged 20, arrived from China with nerve-lepra; she was sent to this asylum on August 9, 1861, and on the same day there was admitted from the same ship, Kok Keong, male Chinese, one-and-a-half years diseased with the same form.

On October 31, 1861, the following case was admitted into the Asylum :—Chang Ching Fike, male Chinese, lately arrived, and four months diseased with nerve-lepra. Neung Shee, female Chinese, aged 18 years (No. 2447), was received into the asylum direct from on board the ship *Agra*, which arrived in 1862. The ship *Persia* also arrived in the same year from China, bringing the following lepers, who were admitted suffering with the nerve-lepra, on August 1, 1862 :—

Lui Chee, female, aged 23.

Kong Cheung, male, aged 23.

Yif a Lang, male, aged 22.

* "Leprosy Report," p. 70

In 1863, Kong Shee, female Chinese, aged 24, arrived here diseased; and in 1864, Pong Shee, female Chinese, aged 22 years. In 1858 there arrived from India, with leprosy, ex *Ganges*, Khodobaccus, male Hindoo, aged 22 years, indentured June 7, 1873, to Pln. Farm.

It is difficult to arrive at a satisfactory calculation of the number of lepers in 1858, particularly with regard to race. From the "Leprosy Report" (p. 44) I take my predecessor's figures as representing the percentage of the latter affected with leprosy in 1860, which I have verified from the records of the asylum :—

	Per cent.
Among the white	4
„ „ coloured	22
„ „ negroes	67
„ „ coolies	7

The last two races are affected now in nearly equal proportions, showing the disease has, at any rate, increased among the East Indians. No mention, it will be observed, is made in the above return of Chinese.

In 1864 a Commission was appointed by His Excellency, Mr. (now Sir) Francis Hincks, consisting of Dr. Manget, Surgeon-General, and A. Houston, Esq., Chairman of the Poor Law Commissioners, to "inquire into the existence and progress of Leprosy in the Colony," from whose report I extract the following information :—The Commissioners set out the difficulty of the task set them owing to a "natural reluctance amongst the people to admit that the disease existed, or had existed, in any members of their families, and a determined resolution to keep back information," a matter just as difficult to-day, and rendering any conclusion arrived at merely an approximation. They give it as their opinion that "Leprosy exists in its worst forms in British Guiana," and they append a list of the number of persons afflicted with the disease :—

	Males.	Females.	Total.
Berbice	80	56	136
Demerara	53	32	85
Essequibo	28	25	53
Georgetown	38	26	64
Leper Asylum	96	35	131
			469
Dr. Shier's list from Estates in the Colony			90
Grand Total			529

If we take the above figures as correct, without calculating the number of cases concealed or unknown to the Commissioners, we still have an increase of 119 cases from the last return, given at p. 159.

Statistics from the Asylum Records will be reliable as far as they go, and they may be taken as some indication of the state and progress of leprosy during the past twenty years.

On the opening of the General Leper Asylum, at Mahaica, on the 19th of May, 1858, there were as inmates :—

	Males.	Females.	Total.
	66	11	77
The remaining number were allowed to roam about the country, and from some cause or other the disease spread broadcast throughout the land.*			
On the 31st of December, 1859, the number of inmates were increased to	80	25	105
In 1861 we find the numbers are	95	28	123
In 1863 „ „ „	129	36	165
In 1865 „ „ „	149	48	197
In 1866 „ „ „	173	59	232
In 1868 „ „ „	196	61	257
In 1870 „ „ „	231	72	303

The number of inmates in the last-mentioned year reaching far beyond the requisite accommodation at the asylum. From a rough calculation I have made, it would appear that at the present time one in every five hundred of the population suffers from leprosy.

* At the same time the general health of the people improved, as evidenced by the ratio of birth to death rate.

In 1879 an attempt was made by the Executive to ascertain the number of lepers in the country, and a report on this subject was prepared from returns sent in by medical men from various parts of the Colony, but which, for several reasons, is not looked on as even approximately correct. The return only included some 525 lepers, 270 of which were from the leper asylums of the Colony, and 42 from one district, Mahaica; cases of leprosy personally examined by the writer, and classified thus :—

	M.	F.	Children.	Total.
No. of Lepers at Pln. Melville . . .	4	2	5	11
,, ,, ,, Greenfield . .	11	1	0	12
,, ,, ,, Cane Grove . .	5	0	0	5
,, ,, ,, La Bonne Mère .	1	0	0	1
,, ,, ,, Helena . . .	4	0	0	4
,, ,, ,, Spring Hall .	1	0	0	1
,, ,, ,, Mahaica Village	4	4	0	8
	30	7	5	42

As there are more than thirty other districts besides Mahaica, where cases of leprosy are to be met with, it is considered by competent observers that the figures given in the above-mentioned report are far from correct. Moreover, the return did not include the lepers on the Berbice river, where I am informed by Mr. Sutherland Gordon there is quite a colony of them, and No. 2 canal, where many cases are also to be found. On the report being sent to Dr. Manget, the Surgeon-General, for an expression of his opinion, that officer made the following valuable remarks under date the 3rd of December, 1879 :—He was of opinion that leprosy prevails to a much greater extent than what is stated in the replies sent in ; " Scarcely a week passes without some new cases presenting themselves at the Colonial Hospital and my private residence. Many young children are brought to me in the incipient stage of the disease. Leprosy is on the increase among the Creole population, but the Coolies are those who by far add to the number. Every immigrant ship brings cases which, if they do not show the characters of the disease when first landed, soon show the symptoms of the disease." Dr. Manget, in his letter, speaks of

the "odour (*sui generis*) which lepers exhale," and believes the disease is contagious: "I do not mean that mere contact with a leper will prove hurtful, but I maintain that long and continued contact will prove prejudicial; the odour referred to, and the exhalations, must prove injurious." The Surgeon-General goes on to state that "the only remedy is the absolute and strict segregation of the afflicted," and he gives a list of cases of leprosy registered at the Hospital since 1870 :*—

Year.	No. of Lepers dealt with before being sent on.	Year.	No. of Lepers dealt with before being sent on.
1870	14	1875	24
1871	11	1876	44
1872	10	1877	61
1873	9	1878	48
1874	14	1879	67

a decided increase in the number of cases since 1870. Besides these, observes Dr. Manget—"There were a number of cases dealt with in which the disease was not sufficiently advanced for their being sent to one of the asylums." In my official report for 1878 I gave a table showing an increase of one hundred and sixty per cent. of cases of leprosy during the twenty years 1858-78, the general population having increased but forty-five per cent. during the same time.

During those twenty years, eleven hundred and twenty (1120) persons suffering from this disease were admitted into the General Leper Asylum—viz., males, 897, and females, 223.

Of these there were :—

Natives of	British Guiana (*black and coloured*)	487
„	East Indies	339
„	Africa	131
„	China	87
„	West Indian Islands	39
„	Cape de Verde Islands and Madeira	32
„	Dutch Guiana	2
„	Brazil	1
„	England (Great Britain)	1
	Total	1,120

* Before being sent on to the Leper Asylums.

They comprised :—

Labourers	792
Tradesmen	60
Domestic Servants . .	69
Others (*not mentioned*) .	199
Total	1,120

The native parishes of the last 504 cases have been ascertained with correctness, and it throws some light on the mode in which leprosy is propagated.

Parish of St. George (*City of Georgetown*) . . .	135	cases.
„ St. Mary (*where the General Leper Asylum is situate*)*	153	„
„ St. John	38	„
„ St. Saviour	21	„
„ St. Luke	14	„
„ St. Mark	13	„
„ St. Peter	10	„
„ St. James	12	„
Parishes of St. Andrew, Patrick, Clements, Augustine, Swithin—each 7	35	„
„ St. Matthew, Trinity, and All Saints, 6 each	18	„
Parish of St. Simon, 10 ; St. Phillip, 4 ; St. Michael, 3	17	„
„ St. Paul	38	„
Total	504	„

Excepting the City of Georgetown, where lepers may congregate for the purpose of asking alms, there is no reason why one part of the Colony should be more liable to leprosy than another. By the Registrar General's Returns for the past ten years the Parish of St. Mary is shown to be about the healthiest part of the country.

I ascertained the duration of the disease on admission among 564 cases, which I have given in tabular form. The number of those

* The inmates of this asylum were allowed for years to mingle with the surrounding inhabitants.

recently diseased shows how prevalent leprosy is in this part of the world.

TABLE.—*Duration of the Disease amongst* 564 *Lepers admitted into the General Leper Asylum during the ten years*, 1868–78.

Duration.	Below 1 year.	1 to 5 years.	6 to 10 years.	11 to 15 years.	16 to 20 years.	21 to 25 years.	26 to 30 years.	31 to 35 years.	36 to 40 years.
Number of Cases.	79	375	60	36	7	2	2	1	1

PART III.—*Propagation of Leprosy—Supposed Causes.*

The India Office published, in 1872, a "Scheme for obtaining a better knowledge of the Skin Diseases of India," by the late Dr. Tilbury Fox and Dr. Farquhar, where the causes of the propagation of leprosy are stated to be mainly the following:—

1. Intermarriage of the leprous, or with the leprous.
2. Hereditary transmission.
3. Inoculation and cohabitation.
4. Vaccination.

In investigating such an important subject, the truth will best be arrived at by pursuing some systematic course of inquiry and record; I purpose, therefore, following the lines laid down by these authorities, and placing my observations under each of the above headings.

1. *Intermarriage.*

It is conceded on all sides that this must account for a certain number of cases of leprosy, but this influence will be better considered in conjunction with hereditary transmission and cohabitation. It may be mentioned here that in Provence, Asturia, Galicia, some Dutch families at the Cape, &c., leprosy is confined to certain families, being perpetuated through intermarriages.*

2. *Hereditariness.*

The influence of *heredity* in the propagation of leprosy is all but universally acknowledged, and may be taken as a recognized factor; it cannot be denied that the disease, or a predisposition

* Liveing, *loc. cit.*, p. 86.

to it, has been apparently transmitted by parents to their offspring. Danielssen and Boeck insist that hereditary tendency is a chief cause of the propagation of the disease in Norway; that it may be transmitted collaterally as well as direct, and sometimes skips a generation. The following opinion on the point was pronounced by the Leprosy Committee of the Royal College of Physicians:*—"There is an almost unanimous concurrence of opinion that leprosy is often hereditary; but that it occurs frequently in persons in whom no hereditary tendency can be traced, appears to be equally certain. In what proportion of cases the disease is of hereditary origin is often extremely difficult, if not impossible, to determine." And, in a foot-note, they give the extract from Danielssen's and Boeck's work bearing on the subject.† Dr. Carter, in his work on leprosy, deals with the subject more fully, as far as the Presidency of Bombay is concerned. From page 184 I extract the following "Summary" of certain tables relative to "Inheritance in Leprosy," to which I would direct attention:—

Summary.—Number and proportion of blood relations likewise affected, who were mentioned by 1,564 individual lepers, as detailed above:—

	Number.	Per cent.
Direct Line.		
Father and others	684	43·8
Mother and others	197	12·6
Parents and others	70	4·4
Grandparents, &c.	53	3·4
Total	1,004	64·2
Collateral Line.		
Uncles, aunts, &c.	226	14·5
Co-equal Line.		
Brothers and sisters	334	4·3
Total	1,564	100·0

* "Report," p. 68.

† "From these tables (referring to certain tables compiled by the Norwegians) it will be seen that, out of 213 leper patients, the disease was hereditary in 189, and that in 28 cases

In a foot-note this author refers to the points of divergence between his and the Norwegian investigations, where heredity was shown to be more frequent on the maternal side, perhaps owing to the larger number of female lepers in Norway.

The latter writers drew attention to the fact that hereditary influence, further, was continued from generation to generation, not only skipping a generation, but re-appearing, for instance, in the second and fourth generation, with greater force than in the first and third. Similar statistics to these are unattainable here, on account of the absence of all record, the migratory nature of the inhabitants—living from place to place, with no fixed home or family ties—the extent of immorality among the negroes, and the desire to hide the knowledge of any family taint.

Hereditary influence was acknowledged among the cases admitted into the Guiana asylum, as follows :—

	Per cent.
In cases of tuberculated lepra	16
In cases of non-tuberculated lepra . . .	12
In cases of mixed tuberculated lepra . . .	40

Out of 138 cases of leprosy, of whom I have notes, heredity was acknowledged by 14 in the direct line, and 11 in the collateral line, or 18·09 per cent.

In the 138 cases there were 31, or 16·48 per cent. with a history of heredity; in 15 the direct, in 2 the co-equal, and in the remainder the collateral branches of the family being afffected :—

only it was of spontaneous development. Moreover, it will be seen that the hereditariness was more frequent in the collateral line than in the direct line. . . . . We have already said that leprosy may be acquired. We speak of those cases where the malady declares itself in persons born of healthy parents, in whose families the disease has never been seen, but who have resided, for a longer or shorter period, in countries where it is endemic, and who have lived under conditions liable to occasion its development."

Direct Line.

Father and twin brothers	2	cases.
Mother and sister	2	„
Father and step-brother	1	„
Mother alone	3	„
Father alone	2	„
Both parents	3	„
Father and sister	2	„
Total	15	„

Co-equal Line.

Brother alone	2	cases.

Collateral Line.

First cousins	6	cases.
Uncle alone	4	„
Nephew alone	2	„
Aunt and niece	2	„
Total	14	„

It will be seen from the preceding figures that the mixed form is the one in which a taint has been most frequently transmitted, and I mentioned the case of Jos. L——, where both forms of the disease were combined in the person of the offspring. For instance, if the father has T. L., and the mother nerve-lepra, the child most frequently will be affected with mixed leprosy.

Much stress has been laid on the fact, and it has been brought forward as a proof of the non-contagious nature of leprosy, that very often only one member of a tainted family will be found afflicted. This circumstance, which may be an argument in favour of a predisposition merely being transmitted, requiring other conditions to develop the disease, on a closer investigation will not be found to occur so commonly as is generally supposed. Leprosy has a tendency to remain latent, and takes a long time to incubate and manifest itself. Many writers admit that if cases could be watched from a sufficiently early period to their termination, not-

withstanding the isolation they are subjected to—quarantined, as it were, from the healthy—the immunity said to be often enjoyed by the other members of the leper's family will not be found nearly so general as it is alleged; and I contend that, when leprosy is present in the parents, while a predisposition is often transmitted, and undoubted disease appears in some of the offspring, latent disease may, nevertheless, exist in the others, requiring debility, want, an attack of yaws, syphilis, &c.—something to call the germs of the disease into activity.

Families also disperse, and some straying member, with a taint in the system, may be the means of transmitting to his or her offspring—ignorant of the existence of it—this loathsome affection. In other cases the leper offspring dies at an early age, and doubts may thus arise; or the parent may succumb to some other disease before the leprous malady has developed, but not before a taint has been transmitted. The bare-faced assertion of some of my admissions, whose relatives had died in the asylum—they themselves being inmates at the time—would astonish and mislead anyone unacquainted with the habits of the people, and can only be accounted for on the supposition that these unfortunates would make it appear as if "fate" had caused their illness, and the fact that some of their friends being lepers might amount to an argument in favour of the contagiousness of leprosy, and that thereby they might be objects to be avoided, and probably isolated.

In the West Indies, as soon as children are a few years old, before the age, perhaps, at which the nerve affection usually appears, they are scattered abroad. Growing up, becoming leprous, and begetting children, all chance of obtaining a family history is lost, and there will be no cause assignable to a disease, which in all probability may have been hereditarily acquired.

I have used the word "predisposition" in connection with hereditariness, one first employed by Virchow, who remarked that hereditariness in leprosy was not to be understood in the same sense as that in which hereditariness in syphilis is intended,

where children are so frequently born with the disease on them—a theory supported by Hebra and Kaposi. The knowledge, therefore, of the age at which children born of leprous parents develop leprosy is most important in deciding whether a "predisposition" merely is transmitted. I stated on page 47, that although a few cases are on record where the child was said to have been born with leprosy, I had not myself met with them, and I was favourably placed for observing several children from birth.

Bidenkap and Van Someren* believe they have shown that, in a large number of cases, leprosy could not be proved to be hereditary, and that, on the contrary, the disease attacks many persons whose families have never shown any traces of it, either in the direct line, or in any of the collateral branches. Hansen denies the influence of heredity in leprosy altogether, while Carter states,† "The *rôle* of heredity has been under-estimated, for, unless modified by other circumstances, it must be supreme."

The following is a list of the births that have taken place at the General Leper Asylum.

List of Births at Mahaica Leper Asylum.

Date of Birth.	Name of Child.	Condition of Parents.	Remarks.
June 2, 1868	Emily Gertrude	Mother a leper	Alive in 1877; condition unknown.
Feb. 1, 1869	Elizabeth	Both lepers	„ „ „ „
Nov. 24, 1869	Orion Mason	„ „	Dead.
Mar. 3, 1870	Jos. L'Esperance	Mother, Non-t.L., father, T.L.	Under treatment for mixed leprosy.
May 22, 1870	Elizabeth	Both lepers	Dead.
May 23, 1870	Josias Nathaniel	„ „	„
June 21, 1870	Maria	„ „	„
Dec. 9, 1870	Alexander	„ „	„
Jan. 4, 1871	Diana	„ „	Alive in 1877; condition unknown.
July 20, 1871	Charles	„ „	Dead.
July 27, 1871	Theophilus	„ „	Alive in 1877; condition unknown.
Dec. 21, 1871	Isidore	„ „	„ „ „ „
Jan. 11, 1872	Thomas	Mother a leper	„ „ „ „
Aug. 9, 1872	Joseph	Both lepers	Dead.
Feb. 7, 1873	Curban	„ „	„
Aug. 29, 1874	Alexander, No. 2	„ „	„
Oct. 8, 1874	Lela	„ „	Alive in 1877; condition unknown.
Jan. 19, 1875	Peter Nicol	„ „	„ „ „ „
Jan. 7, 1876	Rebecca	„ „	Alive; healthy as yet.‡
Sep. 13, 1876	William	„ „	„ „ „
Mar. 13, 1877	Mary	„ „	Dead; lived 4 days.
Oct. 17, 1877	Isaac	„ „	Alive; no signs of leprosy as yet.

* "Brief Historical Sketch of the Madras Leper Hospital." † *Loc. cit.*, p. 180.

‡ These notes were made in 1877.

Leprosy, when hereditary, appears to be principally transmitted through the male line ; and it is a popular idea that, until the third generation has passed, safety from hereditary influence will not be assured. In India, female leper children are said to be three times as numerous as males ; in Demerara there are two leper boys to every leper girl, the proportion of male to female of all lepers being as three to one.

With regard to the influence and results of sexual intercourse with or among lepers, very little has hitherto been written, and much ignorance and uncertainty prevail with reference to the procreative capability of such cases. That leprosy does not necessarily interfere with procreation, the preceding birth list will prove. The latter, it should be remembered, only represents the cases where connection had clandestinely taken place, and is not supposed to represent the sum total of the procreative powers of some two hundred male and female lepers.

A great deal would seem to depend on (1) the form of leprosy ; (2) whether the father, or (3) mother, or (4) both parents are affected.

(1.) In the non-tuberculated form of the disease no change takes place in the organs of generation, and the virile power in the male, or the fecundity of the female, are not necessarily disturbed by the leprous affection. In tuberculated lepra, on the other hand, atrophy of the testes is known to take place, with loss of sexual appetite and power. In the female, also, the interior of the uterus has been found studded with minute tubercles.

(2.) The male parent alone is named as the diseased progenitor in 30 per cent. of all cases that trace their hereditary taint to this source ; in marked contrast with (3), where the mother alone is named only by 10 per cent.; and (4), both parents by only 4 per cent.

This experience closely approximates to that of the East Indies, where, according to Carter,* the following are the statistics :—

* *Loc. cit.*, p. 184.

Father is named in 43 per cent. of hereditary cases.
Mother „ 12 „ „ „
Parents are „ 4 „ „ „

In China leprosy is said to become mild in the third generation, and to run itself out in the fourth. For this reason lepers usually intermarry only with those in whom the same degree of disease exists;* other authorities, however, state that the disease appears with greater violence in the third generation.

Among some of my female patients, four lepers had one child each; five had two children each, but they all died young; only one had three children; two had four children, all of them dying young.

Referring to the birth list once more, it may be seen that in 1877, when the notes relating to these children were taken, 11, or about 50 per cent., had died within a less time than ten years.

In Norway, in eighteen years, from 1856-1873, by enforcing strict segregation, the number of lepers decreased from 2,850 to 1,856, or 56 per cent. With these statistics before us it would be reprehensible to allow such a disease to devastate the population, by permitting the unhealthy to remain commingled with the healthy portion of the community.

3. *Inoculation, Cohabitation, or Contact.*

That true leprosy may be propagated by proximity, or contact, popularly termed contagion, has been believed in from the earliest period of time, and testimony to this effect made by many of the early physicians. Hebra and Kaposi,†—recent authorities on the subject—state the disease was most prevalent at the time of the Crusades, having been introduced from the East by the Crusaders. It subsequently spread with amazing rapidity throughout Europe, by some writers referred to as an "epidemic of leprosy." Drs. Fox and Farquhar, in the "Scheme" before mentioned, express a very

* "Leprosy Report," p. 68.

† *Loc. cit.*, p. 122.

decided opinion that the disease was thus introduced and propagated, and that it was only extinguished by strict segregation.

In the eleventh century, leper houses or villages were established in England, where segregation and isolation was strictly enforced, and before entering which a funeral service was read over the leper. He was clothed in a distinctive dress, and was obliged when he went out to ring a bell or sound a wooden clapper, receiving any alms in a bag at the end of a long stick. The segregation was systematically enforced under penal enactments, the leper being forced to retire to these retreats. All this is matter of history. Meanwhile, the malady decreased, until it finally disappeared from the British Isles. It should, however, be stated that this theory—viz., that owing to segregation leprosy decreased, has been controverted by some authorities, amongst whom are no less than the Committee of the Royal College of Physicians, London, who have played so prominent a part in the history of leprosy. Their theory of the decrease is—the bettering of the diet of the working classes, and improved hygiene generally. Much greater importance has, however, been attached to segregation as the factor in its diminution in those countries where the disease once flourished, than either natural decay, improved hygiene, or "wearing linen next the skin." Even to this day, banishing lepers to certain villages, or placing them at the outskirts of the town or hamlet, is practised in India and elsewhere; whilst it has been shown that, in Norway and in Surinam, a marked decrease in the number of fresh cases has resulted therefrom. The decline of leprosy in the British Isles may be ascribed to improved conditions of life, but it should be added that this has been considerably aided by segregation, and by the instinctive dread of mankind which leads to intercourse with lepers being avoided.

The latter Committee prepared a series of questions which were sent to numerous places abroad. They collated the papers received by them in reply, and in 1867 they published their Report referred

to. With reference to the subject of contagion, they state (p. 69): "The all but unanimous conviction of the most experienced observers in different parts of the world is quite opposed to the belief that leprosy is contagious, or communicable by proximity or contact with the diseased." This strong expression of opinion from the highest medical authority in England necessarily carries great weight, and by many has been taken to be final. Medical men, however, who are capable of arriving at a satisfactory conclusion on the subject, have considered that there was hardly sufficient evidence before the Leprosy Committee to warrant so decided an opinion. Certainly a great many cases are given in the Report which go far to justify their decision, and to prove that leprosy is not thus communicable; at the same time, a number of other cases are also given which are hardly capable of any other hypothesis than that of contagion. The latter are characterized by the Committee, and the opponents of the contagion theory, as "untrustworthy," "too meagre," or unreliable from want of particulars; but it should be remembered that, in tropical countries, ten years may mean a lifetime, that people there seldom keep records, and short as the latter term is, it is difficult to come across reliable information extending over this period; and some writers think the disease may remain latent as long as ten years.*

The question, it appears to me, is one of weight of evidence and probabilities. In these pages I have simply endeavoured to collect all the facts I can bearing on the subject, as well as to contribute any experience I may have gained during my superintendence of the Guiana Asylum. I do not for a moment consider that the result will be to entirely upset the opinion of the Committee, but rather, I hope, to stimulate and encourage investigation, feeling assured the matter is far from being finally settled, and I shall be quite satisfied in attaining this object.

In the first place, I have collected from the Leprosy Report itself all the evidence in favour of contagion. I will then submit any

* *E.g.*, Hansen.

further evidence that has since been forthcoming, including the experience of the British Guiana practitioners, and my own.

Dr. Gordon, of New Brunswick, states (p. 3) :—

It does appear to be propagated by hereditary transmission, yet not entirely so ; as individuals of different races, *living in the same house with lepers, have become infected, and died of the disease.*

Drs. Swanston, Semper and Boon, St. Kitts, W. I. (p. 17) :—

No instance has been known where the disease was communicated by direct contact; but it is probable that it is transmissible by inoculation. There appears to be no risk from sexual intercourse, *provided* there is no abrasion of the parts.

Dr. Checkly, of St. Vincent, W. I. (p. 25) :—

I have met with one case where the disease was said to have been communicated to a child, not hereditarily predisposed to it, by contact with a leper in whom there was ulceration with discharge. I believe leprosy to be communicable in this way, and in this way only.

Mr. Rogers, of Barbadoes (p. 32) :—

I know of two instances where the disease was communicated to two healthy young men by proximity (and perhaps direct contact). In both cases there were ulcerations with a discharge. The young men ultimately suffered from the same form of the disease.

And Dr. Goding, of the same place (p. 32), states :—

In two instances contagion appeared to be the influencing cause. In one instance, of two sisters (one leprous) living together, and avoiding all intercourse with other people, the second sister, who had for many years waited upon her leprous sister, eventually became affected.

Another medical man at Barbadoes, Dr. Stevenson, reports (p. 32) :—

I think it may be communicated by direct contact. In the latter stage, when there are ulcerations, with an unhealthy discharge. One was that of an individual who occasionally slept in a bed soiled with the discharge from a leper ; the other was in a servant who dressed the ulcers of a leprous patient : both became leprous, although not related to the patients ; nor was there any hereditary taint.

Dr. Aquart, of Grenada, W. I. (p. 36) :—

I have seen a few persons amongst those affected where contagion appeared evident. A young girl, about 12 or 14 years of age, slept in the same bed with a young woman who had symptoms of leprosy. Within twelve months the girl presented the red patches, and seven or eight years afterwards she was a confirmed leper. . . . . I consider that contagion will take place when ulcerations exist with copious discharge, and this commonly occurs in the first, or tuberculous leprosy.

Dr. Elliott, of Tobago, W. I. (p. 37) :—

I have not seen, but have heard, and I am disposed to believe it, that leprosy is contagious.

Dr. Manget, Surgeon-General, British Guiana (p. 45) :—

I have met with only two cases in which, after minute inquiry, I believe the disease to have been communicated by direct contact. My own opinion is in favour of the contagiousness of leprosy, and that it may be propagated by the matter of ulcerated tubercles being applied to any raw surface; but I admit that I have met with cases which would seem to preclude the idea that the disease can be considered contagious, in the ordinary sense of the term. Of the two cases alluded to above, one occurred in an Englishman, aged 35. After having cohabited for several years with a coloured woman, by whom he had a child, suspicious spots appeared on his face and body. He went to England, where he remained two years, during which time the disease remained stationary. He returned to Demerara for some time, but in consequence of the progress of the malady he again returned to England, where he died with all the characteristic symptoms of confirmed leprosy. The woman was not suspected of having any taint of the disease while living with her paramour, although it was afterwards discovered that there had been some spots on her body previously, and one of her sisters was decidedly leprous; eventually she also became unmistakably affected, and the child also, when about five years of age, exhibited signs of the disease.

The other case was also in a white man, H. R., aged 25. He, it was believed, caught the disease by occasionally sleeping in the same bed, and making use of the same tobacco pipe, with a Maltese youth, who "had at the time leprous spots, of which H. R. was not aware." After an acquaintance of about six months, ugly reddish spots appeared on his face and other parts of his body. The hands and feet began to swell, and soon afterwards the nose and ears. Gradually the disease ran through its successive stages of tubercles, ulcerations, inflammation of the mucous membrane, &c., and he died in about twenty months after the first manifestations of the symptoms.

Dr. Reed, late Medical Superintendent, Leper Asylum, British Guiana (p. 45), in answer to the question No. 10, "Have you met with any instance of the disease appearing to be contagious in the ordinary sense of the term—*i.e.*, communicated to healthy persons by direct contact with, or close proximity to, diseased persons?" replies :—

Yes. The leprosy was in the ulcerative stage. The first case was in a soldier, a white man born in England; he got the disease when 55 years old, and died in the asylum, aged 62. His case was one of the "joint evil" form. The second case was that of a negro boy, aged 12; he was in the habit of associating with a leper affected with the tuberculous form, and had ulcers.

Dr. Pollard, of British Guiana (p. 45) :—

I am clearly of opinion that it is contagious in every stage and form, and especially so after ulceration. I have seen many instances which could only be referred to contagion; the convictions of the parties, and the most rigorous examination of the history of the cases, giving no clue whatever to the pre-existence of any family taint. It is notorious in respect of a white family of distinction in this Colony that, having disregarded the warnings of their medical advisers, of the danger of permitting the young members to play in company with a negro boy who exhibited the symptoms of the disease, they one and all became infected, and the majority of them fell victims to the fatal indiscretion.

Dr. Duffey, of British Guiana, who formerly was also Medical Superintendent of the Leper Asylum (p. 45) :—

I have known instances where healthy men have contracted the disease from cohabiting with a leprous woman whose genitals were ulcerated, just in the same way as syphilis.

Dr. Carney, of British Guiana (p. 46), in answer to the question No. 10 :—

Yes. The disease was in the stage of ulceration. A healthy girl, aged 7, slept in the same bed with a boy, aged 9, who was diseased; she became affected with leprosy. A woman had connection with an old leprous African; she afterwards became diseased.

Dr. Van Holst, of British Guiana (p. 46) :—

From what I have seen and heard in Surinam (Dutch Guiana), where more attention is paid to the disease than in British Guiana, I believe it to be contagious. I have known an officer of high rank there contracting it from cohabiting with a woman whose family were affected with it. In Dutch Guiana people are afraid of shaking hands with any persons who are suspected of the disease, or even sitting on the same chair which they have occupied, or of using the same privies.

Dr. De Castro, of Constantinople (p. 70) refers to certain cases, published in the *Gazette Medical d'Orient*, Mai, 1861, in a few of which "the transmissibility in this way (*i.e.*, contagion) was, I think, certainly proved."

Dr. Regnaud, of Mauritius (p. 86) :—

The two following cases have recently made me consider whether the disease may not be transmissible under certain circumstances. 1. A white man, affected with the anæsthetic form of the disease, had a fœtid ulceration of the heel. His wife, as well as myself, were in the habit of dressing this daily. She was probably less careful than I was in washing her hands after such dressing. A month after his death a tuberculous spot appeared in her right cheek, and within the next two months several other spots were seen over her body; since then, there can be no doubt that she has become leprous. It is now eight months since the death of her husband. 2. A black native woman, who had a child of 5 years of age by a former husband, married a black native affected with tuberculous leprosy. The

child, who was much in the company of the husband, became affected with the nerve form of the disease. There was no traceable hereditariness in the family, either of this child's mother, or of the wife in the preceding case.

At page 90, it is stated, on the authority of the Civil Commissioner of Seychelles, that "Dr. Robertson, formerly in medical charge of the Curieuse Leper Establishment, was himself an unmistakable leper. The disease was not in a very advanced stage, but of its presence there was no doubt whatever."

H. C. Bowser, Civil Surgeon, Bancoorah (p. 141), in answer to question No. 10: "Yes; when the disease is in the stage of ulceration: but there must be actual contact, either of the person, or clothes worn by the sufferers, or from bathing in the same reservoir."

N. Jackson, Esq., Civil Medical Officer, Sumbulpore (p. 141) :—

I have never known or heard of a case in which simple contact on one occasion has produced the disease; but, by prolonged liability to contact with, or close proximity to, diseased persons, there is reason to believe that the disease has been reproduced.

A. A. Mantell, Esq., M.D., Cuttuck (p. 141) :—

I have met with one undoubted instance in which the disease was communicated by contagion. The disease was in its last, or ulcerating, stage; the fingers and toes had nearly all dropped off. The following is the history of the case:—"Agadoo, aged 30, a Brahmin, states that none of his family had ever suffered from leprosy. His parents are both dead, and his five brothers and sisters, who are all living, and quite healthy, have made him an outcast in consequence of his disease. He is a married man, but never lived with his wife. He has never had syphilis. When about twelve years of age he suffered from fever, but until he got leprosy remained quite healthy. He caught the leprosy from his master, a merchant, whose bearer he was for twelve years. His duty was to wash and dress this merchant's sores, and lift him in and out of bed. The merchant died three years ago of leprosy. At the time of his death he was covered with sores, and had lost several of his fingers and toes. The bearer was attacked within twelve months of his master's death; it commenced with patches on the fore-arms, which gradually spread over the body; at the same time anæsthesia of all the affected parts set in; the skin of face, nose, ears, lips, and brows became thickened, the conjunctivæ red, and a sore broke out on the right foot."

N. C. Macnamara, Civil Surgeon, Mozufferpore (p. 141) :—

I know of many cases in which there was a clear proof of the contagious nature of the disease. A very good instance of the kind was related to me by my sub-assistant-surgeon this morning. He has lately come down from Alworah. During

the year 1852 he first became connected with the hospital established there by the mission for lepers; at that time the Chokedar and his mate were healthy men, and though constantly with the patients in the establishments, they lived at the extreme gate leading into the hospital compound; in 1856 both of these men were inmates of the hospital, suffering from the very worst form of leprosy. There was not the remotest reason to suppose that the parents or relations of these men were affected with the disease, and there is only one way of supposing they got it, and that was by contagion. I believe leprosy is alone contagious when the ulcerative stage has commenced; and it appears as if the disease took a very long time to affect the system. It is not a matter of days or even months, but often years.

W. P. Harris, M.D., Budaon, N. W. Provinces (p. 163) :—

I have met with instances in which the disease proved to be contagious after living in close proximity to the diseased person for a long period of time, say one or two years. The malady was in full vigour, and there were ulcerations with a discharge.

Surgeon-Major Rose, Singapore (p. 198) :—

I have met with three cases in which I can with certainty state the disease was contracted by continued and direct contagion.

1. W. E——, aged 11, male, European, examined on the 26th of March, 1864, found with well-marked tubercular leprosy. *History.*—Stepfather states that, to his knowledge, the disease was never known to exist in the family, but says that some three or four years ago patient was in the habit of constantly associating with a Chinese boy who was suffering from the complaint (this statement is borne out by the patient), and thinks it may be attributable to that cause. Patient was suckled when a child by a wet nurse who, to all appearance, at that time was free from the disease. . . . . Patient's previous state of health was very good.

2. H. de Souza lived with my apothecary, Mr. Sneider(whose nephew he was), for some years; Mr. S. labouring under confirmed leprosy at the time, of which he died in 1861. Some time before his death extensive ulceration set in, attended with a profuse, offensive discharge, but the lad contracted the disease before this appeared. M. de Souza died last year with leprosy fully developed.

3. Sheik Hussain, a convict from the Madras Presidency, whilst acting as hospital orderly to Mr. Sneider above mentioned, contracted leprosy from him, and died in less than twelve months from the time the disease first became manifest; prior to death ulceration of the hands and feet had set in.

J. Jackson, M.D., of Bengal, specially applied to by the Committee for his opinion, states (p. 202) :—

It is not a contagious disease in the ordinary sense of the term. . . . . There is a doubt in my mind in regard to inoculation. A respectable European mentioned having contracted the disease from a favourite servant who was constantly about his person. No one with the tubercular form, when it is attended with ulceration, is allowed to remain as a servant. I have always considered it my duty to warn any master of a family when I have known a leper amongst his servants, no matter how mild the case may be.

Dr. Davison, of Madagascar, also affords valuable evidence (p. 221) :—

It certainly deserves notice that, while the laws of Madagascar excluded leprous persons from society, the disease was kept within bonds; but after this law was permitted to fall into disuse, it has spread to almost an incredible extent. There is no doubt that this result is partly owing to lepers being allowed to marry without any hindrance, but the natives are also strongly impressed with the conviction that the disease is inoculable. In Madagascar there are a number of different races, of all shades and colour, from the poor negro to the Hovah. These occupy widely varying climates. . . . . The circumstances and modes of life of these races are as varied as their origins and the nature of the localities in which they reside. *Yet leprosy affects all alike.* The Hovah, who lives in European fashion, and in a temperate climate, is not less exempt from the scourge than the African slave. It is found amongst the Betsemasarahas who eat pork, and amongst the Betanmenas, who abhor it. It occurs where fish is an article of food, but it is also to be seen where no fish is to be had, and where rice and vegetables satisfy the simple wants of the population : it exists in town and country, at the elevation of 7,000 feet above the sea level, along the coast line, and through all intermediate elevations. Probably the dirty habits so prevalent in half-civilized nations must tend to aggravate it; eating from a common dish with the fingers; the custom, very common in Madagascar, of interchanging garments, and of all lying huddled promiscuously together at night, cannot fail to render it more inveterate, even if they do nothing in the way of orginating it.

Sir J. Ranald Martin states (p. 227) :—

The dangers to Europeans arise chiefly from vaccination, and from wet-nursing. I felt that very early in my career in India, and I took the precautions which are here recorded.

I saw an English lady last year in a horrible condition (she said) from having been vaccinated from a leprous native child.

From the foregoing, and other unrecorded cases, it will not be wondered at that many practitioners have found it difficult to arrive at a satisfactory opinion on the point; or that the evidence, so far as it went, was not, in their minds, sufficient on which to found any conclusion with a view to legislation. In common with them, I contend that a case for contagion has been made out; but I admit more evidence should be forthcoming before a definite opinion on the subject is promulgated.

I have referred to early writers among the Arabians, Greeks, Hindoos, and some others, who have recorded their belief in the contagiousness of leprosy, although perhaps differing as regards the

manner in which this occurs ; it was only within late years that a contrary belief has sprung up, and it behoves us to ascertain that the departure from these views are not taken except on strong grounds.

The instinctive dread of mankind which tends to keep lepers apart from the general community—isolated in a world of their own—the restrictions which in many countries are placed on their habits and actions, do not favour the spread of a disease among the healthy should it be contagious ; would it be rash to say what might occur were these removed ? Instances are not wanting, as in Madagascar, and in Mahaica, where, on lepers being allowed to mingle with the rest of the community, the disease has spread ; and were the restrictions still further removed in those countries where they obtain, I have no doubt we should observe this increase become more general. Until this is done it is idle arguing to the contrary.

Instances of the isolation to which the leprous sick are subjected in different countries are not wanting in the Report ; and in order to be precise, I introduce a few of them :—*e.g.*, TRINIDAD —where " leprous vagrants, and beggars found in the public streets and highways, are arrested by the police and conveyed to the leper asylum " (Dr. Saturnin, p. 40.) JERUSALEM—where " contact is habitually avoided on all sides ; the lepers have vessels on the ground before them into which the charitable cast their alms " (p. 54). At DAMASCUS—" the villagers are afraid of contagion, and therefore oblige the diseased person to proceed to Damascus, or some other city where there may be a leper-house. Those who do not, or cannot conform to the custom, are made to live in a cave or hut outside the village, where they remain in perpetual quarantine" (p. 57). CEYLON—" There is a public asylum to which the poor sufferers voluntarily resort. Those well-to-do never freely intermix themselves with the rest of the community" (p. 94). BOMBAY PRESIDENCY—" where a harsh custom prevails amongst the lower orders of expelling from their doors any of their offspring

affected with leprosy, who thus swell the ranks of wandering mendicancy" (p. 111). BENGAL PRESIDENCY—where, at *Pooree*, "among the respectable part of the community a leper is not allowed to sit in the same room or house with a pure individual, who will not also on any account suffer him even to touch his clothes or his body" (p. 142). NEW BRUNSWICK—where "they are not permitted to communicate freely with the rest of the community; but as soon as the disease has made its appearance, they are confined to the lazaretto" (Dr. Gordon, p. 4). MONTSERRAT —where "practically they are segregated, as they appear to prefer dwelling altogether apart from their fellows" (Dr. Steventon, p. 19). BARBADOES — where "among the independent classes they sedulously exclude themselves from society. All, from the highest to the lowest, have such a dread of the disease being known in their families, that they keep them out of sight as much as possible. In times of slavery they were never seen begging, but were kept by their masters in cottages set apart for them on the plantation" (Dr. Young, p. 33). RHODES—where, as soon as the disease attracts attention, "they are banished to a desert spot of the island" (p. 59). CRETE—where "all persons affected are expelled from their town or village, and are sent off to places set apart for them" (p. 64). CANTON—where "the infected persons are banished by their families, who will not eat or live with them, lest they also should become contaminated.

British Guiana is no exception to this rule, as may be seen from the local ordinance governing the subject which may be found at the end of this memoir, and further instances might be given of the fact that lepers are socially quarantined; it is almost impossible to observe its spread in the same way as if these impediments, legal and otherwise, were removable.

Macnamara makes the following important statement:—

> That leprosy does not spread among the natives of India by contagion is in itself an hypothesis; but presuming it to be the fact, it may be explained; for although lepers move about among their countrymen, they are to a great extent isolated from them. Who ever saw a healthy native touch, much less eat with one affected with

leprosy. In many parts of India the mere fact of admitting a leper into a general hospital is sufficient to drive every other person out of it. The wealthy leper may purchase immunity from some of the social evils to which his poorer brethren are exposed; but even he is frequently obliged to leave house and home, and wander as an outcast over the face of the earth, visiting shrines and holy places, in expiation for his sins, which he believes have been punished by the infliction of leprosy. Rich and poor lepers, however, though living and moving among their fellow-men, are as isolated from them as were those condemned to the lazar-houses in the Middle Ages.

And now comes an important question, whether any further information has come to hand since the Report of the Committee was prepared, that in any way throws additional light on the propagation of leprosy?

The late Dr. Tilbury Fox read a paper at the Epidemiological Society, reported in the *Medical Times and Gazette* (vol i. 1867, p. 297), in which, referring to the Report, he pointed out the significant fact, "that it is in those places where leprosy is on the increase that the freest intermingling of the leprous and non-leprous part of the community takes place." He also stated, "such cases as that of Honolulu (to be presently mentioned) should make us pause before we finally conclude to encourage free intercourse with lepers;" and at the same meeting he gave his opinion that leprosy may be communicated by long contact and the medium of the secretions, urging that "before we could absolutely deny the contagiousness of leprosy, we must explain away certain remarkable facts with regard to the production of the disease in clean persons and communities."

Great stress was laid by the Committee on the evidence of Danielssen and Boeck, of the Norway Asylum, against the contagiousness of leprosy, their testimony being necessarily very valuable. With regard, however, to that country and asylum, cases are forthcoming which bear out this view.

The following are reported by G. Armauer Hansen,* Assistant Physician to the Leper Hospitals, Bergen, Norway:—

1. Anders Hegrenaas, 63 years old, labourer, tubercular form;

* On the Etiology of Leprosy: *British and Foreign Med.-Chir. Review*, April, 1875. p. 468.

born in Jólster. States the duration of the disease to have been about three years in 1871. Does not know any leper in the family, which is also probable, as leprosy is very rare in Jólster, and he is not related to any of the lepers who have been registered since 1856. He has been in Bergen more than twenty years; quitted thirteen years ago his service at Lungeguard Hospital, where he had been bathing attendant four years, and therefore had been in close contact with the patients.

2. Anne Larsdatter Starefos, 51 years old, tubercular form; came twenty years ago to Bergen, and dwelt with a sister at Starefos, a farm which lies high up on the Floifjeld, close to the Asylum No. 1, and the Lungegaard Hospital. She was washer-woman at the Asylum No. 1 for ten years; and three years after she ceased to be so her leprosy was undoubted; but she had, however, long been suspected of not being healthy. She earned her living at that time by washing bottles in a beer brewery. She was born on the farm Munie, in a mountain valley about two miles from Bergen. All people there are agreed that there never has been any leprosy in the valley. It is in any case certain that her parents, their brothers and sisters and parents, have all been healthy, and that she is the only leper known in the families from which her parents descend.

3. Joachim Berentsen, sailor, 26 years, tubercular form. His parents, who are still living, were born at Bergen. The parents of his sixty-years-old father (Lars Andersen) were both born in Indre Holmedal; they moved so early to Bergen that all their nine children, of whom the patient's father is the youngest, were born in Bergen. There are dwelling in Bergen, grandchildren and great-grandchildren of them, who are all healthy. The mother's parents were from Herningdal, where there is no leprosy, and from Bergen. They had two daughters, of whom one has a healthy daughter, and the other has, besides our patient, two healthy children living. The patient resided, at the age of 15 years, in 1858–59, for half a year at Spidsöen, and during that time had intercourse with the

natives round about, and also with families where leprosy had existed. Kari Spidsöen, a girl of about the same age as the patient, had then many leprous spots, and she and the patient played constantly together. It is not supposed that any more intimate connection took place. After his return to Bergen the patient worked on the Tyskebrygge, and very soon after his return, about half a year, his father remarked in his son an altered complexion, which aroused his apprehension of leprosy. This apprehension became certainty when his son went to sea in 1863. The patient himself became apprehensive of leprosy at the end of 1864, after having suffered from ague in Sulina ; but he did not discover any undoubted marks of the disease until the year 1865.

4. Lyder Eriksen, carman, 27 years old, tubercular form. He was born in Bergen ; a natural son of healthy parents, born in Bergen ; has a healthy sister born of same parents. The mother's father was from Aunland, in Sogri, and the mother from Hallingdal ; the latter was not aware of there being any leper in her own family. The father's mother was of German origin, but his father was from Voss. He was healthy, but I have not been able to obtain any other information as to his family. There are dwelling at present in Bergen not a few relations of these families, and they are all healthy excepting our patient.

The patient was, during a part of his childhood, taken care of at the farm Lone, about two miles from Bergen. There were no lepers there, but at the neighbouring farm Espeland, there was one, and the patient was often in contact with him. The patient was badly taken care of at Lone, and suffered, *inter alia*, from favus and scabies. About eleven years ago he came back from Lone, but was there again for a short time the year after. The patient states that the disease broke out in 1870—that is, about four years ago ; but his old grandmother, about eight years ago, called his mother's attention "to a bluish discoloration over the eyes, like a shade," which she did not like, and was of opinion that the lad was not all right.

With reference to these cases, Hansen observes (p. 470) :—

It must certainly be admitted that the most probable explanation of the origin of these cases of leprosy must be sought in infection at the respective places where the parties concerned have been in contact with lepers. There is no holding point for miasma, nor for infection by food, especially in cases 1 and 3, and there remains for us only that mode of infection which we usually designate as contagion. For No. 2 (the washerwoman) there is good reason to suppose that the contagion may be communicated by things which have been in intimate contact with lepers.

Space will not permit of my making any further extracts from this interesting paper, but I will indicate briefly a few more cases that the author relies on to prove that the disease may be propagated by contagion (p. 417) :—

Kund Villa, Tresfjirden, in whose family no leper can be found, rowed during the fishery with Ole Sætre, and lay with him in the same bed when employed in building work in the summer of 1858. In 1859 the leprosy of Ole Sætre was so far advanced that he was sent to Reknæs Hospital, and in 1864 Kund was no longer in doubt as to his own leprosy. . . . In this case contagion seems to be the most probable explanation.

Hansen then refers (p. 472) to the cases of two individuals, "immigrants into leprous districts from non-leprous districts," who became diseased after being in contact with lepers—Oline and Petter Jansen. The latter "has constantly attended to, and taken care of, his leprous neighbour and brother-in-law, Petter Riksheim ; he tended him when dying, and as a corpse, and became leprous shortly after."

I must refer my readers to the original paper for the other interesting cases going to prove the author's theory of the contagious nature of leprosy. His denial of the influence of heredity in leprosy in no way detracts from the value of the practical information he brings forward. Not the least important are the statistics which are made to demonstrate the actual diminution of leprosy in Norway, since the segregation of the leprous sick in leper asylums or hospitals—a decrease which has been doubted. I can do no more than give an outline of the figures which in the paper are dealt with in detail. It appears a list of all the lepers in the country was made by Mr. Inspector Hartwig (p. 479): "In 1836, the number is said to have been 659 ; in 1845, 1122, and in 1856, the number was, according to what we now know, about 2800. There

appears, therefore, to have been a very strong increase." Hansen computes that during this time the average yearly number of new cases was 220. Now mark the result: I am quoting from the same page as that from which the above extract was taken (p. 482):—"In the period 1861–65, there were 998 cases, or about 190 yearly; and in 1866–70, 797, or about 160 yearly. Since 1860 there is, therefore (continues Hansen), a decrease in the number of new cases, which appears to be a steady, and not chance-fluctuation." It was, moreover, stated that no improvement in the condition of the inhabitants could have had any influence in causing this decrease, which was one due solely to the isolation of the cases.

In the pamphlet on "Leprosy," by Mr. Macnamara, this passage occurs:—

> It appears that thirty-six medical officers are of opinion that the disease is contagious, twenty-six are doubtful on this point, and twenty-four deny that leprosy can be communicated from one person to another. The majority, therefore, are in favour of contagion, but it is expressly stated in several of the reports that "leprosy is only contagious in the ulcerative stage."

The same writer (*Indian Medical Gazette*, March 1, 1866) enters into the question of the spread of leprosy in our own and other countries during the time of the Crusades. In the year 1110, the first leper hospital was established at York, and between that time and 1472 no less than 112 others were built in England, and 2000 in France. The extinction of the disease he believes to have been brought about by the "absolute segregation and isolation of lepers, so sedulously ensured by Church and State."

Professor Erasmus Wilson stated at the Royal College of Surgeons, that "Leprosy was probably contagious in tropical and semi-tropical countries."

Liveing, Hebra, and Kaposi, have met with cases in which, in all probability, the disease was communicated in this way. The former,* in mentioning them, states:—

> Do the physical and natural relations of the country alone explain these facts? If not, we are driven to the conclusion that the disease is in some way communicable

* "True Leprosy," by R. Liveing, M.D., F.R.C.P., &c., p. 93.

from the unhealthy to the healthy. For my own part, I am inclined to believe, that though leprosy is not contagious in the ordinary sense of the term, it is nevertheless propagated by the imbibition of the excretions of those affected, much in the same way (not in the same degree) as typhoid fever or cholera are propagated; but as leprosy is developed but slowly, there is far greater difficulty in tracing it home to its true source.

Dr. Liveing, in another place (p. 57), describing leprosy as it prevails in Santarem, Central America, where there is neither hard living, bad food, cold or damp climate, says: "By what, may we ask, is it promoted in Santarem? Hereditary taint or contagion is all that is left to account for it; and it is not contended for by even our opponents, that the former is a sole cause of its propagation anywhere."

In Cayenne and Surinam leprosy has been shown by Boynat-Landrè,* to be communicable by contagion; and from the neighbouring colony of Trinidad there comes a work† which, although by a layman, contains most valuable and practical information, which ought to convince the sceptical. The Rev. Père Etienne, to whom I am indebted for a copy, from his position, not only as chaplain to a leper asylum, but as a clergyman, had means of obtaining knowledge with reference to family histories, &c., bearing on this topic, which to most of us are impracticable or unattainable. His book will amply repay perusal.

One important witness remains to be brought forward. Dr. Vandyke Carter, one of the greatest authorities on the disease, at page 178 of his work states:—

A strong inclination to admit the possibility of leprosy being transmitted in some way from the diseased to the healthy, is manifested by many late writers. Since my visit to Norway, and acquaintance with the late investigations made in Bergen, the possibility in question has become, for me, tolerably definite: and it would even appear that not only is the contagium "particulate," but that it may belong to the class of organisms called by De Bary, "Schizomycetes," and including the various forms of Bacteria, Micrococcus, &c. In favour of the personal communicability of leprosy are historical records, and the known "rapid" spread of the disease in recent time; again, the actual decline of the disease in

* "La Contagion seule Cause de la Lepre." 1869.

† "La Lèpre est Contagieuse?" par une Missionaire (Père Etienne, O.P.), Attaché aux Lèproseries de la Trinidade. Paris: Baillière et Fils. 1879.

Norway, which has now steadily set in, is a fact distinctly in favour of contagion ; and, perhaps, may be added, the peculiarity of leprosy first and chiefly attacking the more exposed parts of the body. Infection from a distance, or through coin, clothing, &c. ; single, temporary, or prolonged contact with leprous emanations ; vaccination ; lactation, or nursing—these are several modes of transport respecting which I have had occasion briefly to inquire, and I find recorded a few affirmative examples, at least, of each one method or means. . . . . With reference to the freedom of medical attendants, servants, nurses, &c., who come into contact with lepers, there are a few known instances of their acquiring the disease ; and others also of husbands and wives affecting each other. Having carefully perused these records, I must say there is, *primâ facie*, a probability of their being strictly true, and hence that in practice *one ought to act as if contagion were possible.*

Again, in " Report on Leprosy in the Bombay Presidency," leprosy has been, and is still, generally regarded as liable to be propagated through contact, by the inhabitants," not only in India, but of all countries where the disease exists or once prevailed ; and though this view may not be upheld by the majority of medical men in India, whose opinions are necessarily based on ordinary observations, yet all would probably admit that special and precise information is needed to thoroughly settle the question. Facts, too, are slowly accumulating which tend to prove, if not in themselves demonstrative, that the casual inoculation of leprosy matter is one actual means of spreading this fell complaint.

An important case, bearing out the theory that leprosy is propagated by contagion, has been contributed by J. Hawtrey Benson, M.D., F.K.Q.C.P., Physician to the City of Dublin Hospital, the patient having been exhibited before the Medical Society of the College of Physicians.* He had been in India for two years, having never previously left Ireland, and came home affected with leprosy. The disease did not show itself for a few months after he came home. He was under Dr. Benson's care in hospital, but after a time returned home, and in a year and a half died of leprosy. During this time his brother wore his clothes, and slept in the same bed with him ; this brother had not been out of Ireland either, except once, forty-six years ago, when he spent some time in England. He afterwards became diseased with leprosy. Dr. Benson remarked that " one fragment of positive evidence on the point was worth a vast amount of negative evidence ; and, as far as he could judge, the evidence which the College of Physicians had before them was principally negative."

* "Transactions of Med. Soc. of Coll. of Phys.:" *Dub. Jour. Med. Science,* 1877, vol. lxiii. p. 561.—"Elephantiasis Græcorum."

The case of Honolulu has been repeatedly quoted and referred to. It will be remembered that Dr. Hillebrand had been there since 1852, according to whom, leprosy could not be traced back there earlier than 1848, when it was introduced by the Chinese, who also imported the disease into Australia. Refer now to an account of leprosy in the Sandwich Islands, as given by Dr. S. Kneeland, of Boston, U.S., in the summer of 1872 :—

On paying a visit to Honolulu, I took some pains to inform myself by actual observation, and also from official sources, on the subject of leprosy in the islands. At the time of my visit there were about twenty patients in the Asylum at Kalihi ; . . . . which in two years had increased to over 200. How it is produced is a matter of question. It was not known in these islands till 1848, at which time it was said to have been introduced by the Chinese; and it was not noticeable as a disease of the country till ten years after. *There can be no doubt that it spread by cohabitation and inoculation of its diseased fluids, in the same way as syphilis.* There is a want of common prudence displayed by the natives, that almost sets at naught the best directed efforts of medical men, and a recklessness displayed in the indulgence of animal appetites that goes far towards eliminating the pity that we are all ready to feel towards these unfortunates. The usually assigned cause of the disease does not exist here. The people are cleanly and well fed—their fine climate prevents physical misery, and malaria is unknown.

The subject of leprosy was brought forward at the stated meeting of the New York Academy of Medicine, Jan. 20, 1881, in a communication by Dr. H. G. Piffard, in which the author, who is not himself a believer in the contagiousness of leprosy, states :*—

On the other hand, it is a well-established fact that when leprosy has once gained for itself a foothold in any locality, it is apt to remain there and spread. A review of the evidence bearing on the contagiousness of leprosy, led the speaker to the conclusion that this disease, like syphilis, is not contagious by ordinary contact, *but it may be transmitted by the blood and secretions. Vaccination may transmit it.* A case in the speaker's own experience was cited in proof of this.

Refering to the prophylaxis of leprosy, Dr. Piffard continued :—

The principles which underlie this are well understood. If a community is to be protected from the spread of leprosy, all cases that exist in it should be absolutely separated from the inhabitants, and each new case should be sent to live at a lazaretto with the others. There are now in the United States over fifty lepers. A suitable lazaretto ought to be established, where these cases, and all subsequent ones, may be isolated and properly treated. The case of the Sandwich Islands illustrates the danger which a country may be subjected to from the spread

* *The Medical Record*, Feb. 19, 1881, p. 212.

of leprosy. Forty years ago the disease did not exist there. Now, one-tenth of the inhabitants are lepers.

Dr. Piffard, in concluding the subject, said that—

He hoped to interest the Academy in the matter of ascertaining the number of lepers in the country, and of obtaining from the Government help in isolating them, and preventing any spread of the disease; for it was known that when the disease once got a foothold, it would almost certainly spread in some way.

Dr. Sturges, of Charity Hospital, in the discussion that ensued, remarked (p. 214):—

There seems to be very little doubt that the question of contagion has a fair showing. . . . . It may turn out that the disease is contagious only in the earlier stages. At any rate, is is a question that would bear much more investigation than it has yet received, particularly in view of the fact that we are exposed to an increase of the disease.

Dr. L. D. Buckley said that "when a book of 300 pages is written in an effort to prove this contagiousness, and by a man who had seen and studied leprosy a great deal (Dr. Bross), it seems to be very strong evidence that the disease is contagious in some way or other."

Dr. George H. Fox at the same meeting said: "As to its contagiousness, if there is only a possibility or probability of this, it is the duty of the profession to the community to take whatever measures are in its power to prevent any spread of the disease."

To turn now more immediately to British Guiana, I find that in 1874 a Commission, composed of E. A. Manget, M.D., Surgeon-General; J. D. Edge, M.D., Staff Surgeon-Major, and J. P. Watt, M.D., Medical Officer to the Immigration Department, was appointed by the Governor of British Guiana to inquire into the subject of the contagiousness of leprosy. Their Report, dated Georgetown, August, 1875, is now before me:—

To His Excellency James Robert Longdon, Esquire, C.M.G., Governor and Commander-in-Chief in and over the Colony of British Guiana, &c.

We beg to lay before your Excellency the following Report in connection with the Commission issued to us, dated the 7th of December, 1874, with respect to the contagion or transmission of leprosy in this Colony.

The Commission states that "whereas it is desirable that full inquiry should be made into the question whether the disease of leprosy has been communicated to

any patient in the asylums or public institutions of this Colony by mere association and contact, or by inoculation or otherwise; and especially to inquire into certain cases of leprosy referred to in a report made to the Honourable Government Secretary, on the 27th of May, 1874, by A.G. M. Cameron, M.D., the acting Colonial Surgeon-General and Chairman of the Poor Law Commissioners, in which there appears to be ground for believing that the disease of leprosy had been communicated to patients in the asylums of the Colony by contact or otherwise; and also to make such inquiries, and to receive such evidence as you may deem proper, in respect to any cases in which you may be of opinion that there are grounds for believing that the disease of leprosy has been communicated by infected persons to other persons previously uninfected, by association, personal contact, inoculation, or any other means, whereby contagious or infectious diseases are communicated from one person to another, and to make your report thereon."

We are here enjoined to open again the vexed question of the contagious or non-contagious nature of leprosy. We cannot but be forcibly impressed with the great responsibility which devolves upon us in even attempting to gather proofs which would upset the—we may say—verdict of the Royal College of Physicians, and of the overwhelming majority of the medical profession, as to the non-contagiousness of leprosy. This responsibility is the greater from the feeling we have, that upon the settlement of the question of the contagious or non-contagious nature of leprosy depends the necessity of enforcing the segregation of the unhealthy from the healthy, and that the principal aim of this Commission is a desire to open the subject *de novo*, and try and settle this long-disputed question.

We are well aware of the difficulty of the task imposed on us, and undertake it with great diffidence as to how our labours and our deductions from the evidence will be received. Those who hold the opinion that the disease is not contagious are too often prone to disregard the cases brought forward by those who entertain a different opinion as based on imperfect observation, or inattention to hereditary taint, mode of living, locality, &c.

We hope the means we have adopted to get thorough and reliable evidence will not be overlooked. That we have often been deceived as to the hereditary taint being the cause of the malady there can be no doubt, for there is a decided objection in every person afflicted to acknowledge that any one of his family is or has been similarly afflicted. We are not called upon to advance an opinion as to the etiology of leprosy. . . . .

It is well to understand what we mean by contagion. We do not adhere to the restriction of the word contagion to the absolute contact of the healthy body with the sick body, or with its visible off-scourings. In all cases the poison is conveyed to the healthy person by particles of matter proceeding from the person of the sick. It is quite immaterial whether these particles be in a solid or gaseous form. We admit the possibility of the disease being propagated through an atmosphere contaminated by the effluvia of a diseased person. . . . We believe, and it it is not unlikely, that a person living continually in contact with a leper, in the same confined room, in which the air is rarely renewed, inhaling the atmosphere contaminated by the effluvia of the unclean, will be liable to be affected by such exhalations, and that the same disease may be produced. Who has ever been

near a leper, especially one with open ulcers, and has not been strongly impressed by an odour, *sui generis*, emanating from such sufferer? Dr. Liveing is of opinion that though leprosy is not contagious in the ordinary sense of the word, it is, nevertheless, propagated by the inhalations of the excretions of those affected, much in the same way (not to the same degree) as typhoid fever and cholera are propagated; but as leprosy is developed but slowly, there is a great difficulty in tracing it home to its true source. This last hypothesis gives the best interpretation of many facts in the past and present history of the disease which would otherwise remain unexplained. But we will ask if the inhalation of the excretions of the afflicted can produce the disease, it is certainly more than probable that the inhalation by the healthy of the exhalations from the breath and perspiration of the diseased will also produce the malady. . . . . Thus far we have quoted the authorities on which we base our opinion that leprosy, although in a great many cases due to hereditary taint . . . . is propagated in not a few instances by contagion. We beg leave to again state that we do not limit the meaning of contact to the mere coming into contact of the sick with the healthy by ordinary intercourse; we adhere to what we said before, that we regard infection and contagion to be the same. We maintain that a healthy person being continually in contact with a leper, breathing the air which is polluted by the exhalation and excreta of the unclean, is liable to be afflicted with the same disease. It is very difficult to collect cases which would prove the contagious nature of leprosy. Unless the attention be drawn to cases of supposed contagion from the beginning, they are soon lost sight of. Many cases have been told to us of the disease being contracted through contagion, but the details are so unsatisfactory, that we cannot avail ourselves of them to our purport. Medical men have met with cases of this kind, but some take no notice of them. Take even the disease of yaws. No one will deny that this malady is contagious; but call on any medical man to advance cases in proof of the belief, you will find great difficulty in elucidating the question of contagion. To corroborate this belief of ours, we have tried to collect cases in the colony, and we have carefully rejected those which did not present all reliable information. We have written to all the medical gentlemen, but, with one exception, failed in acquiring any information as to the subject at issue from the answers to the questions forwarded to them.

Having thus far brought forward those authorities who we consider justify us in asserting the opinion we entertain, that the disease is often caused by contagion, we now come to that part of our report which bears more particularly on the subject matter of the Commission—viz., whether the disease has been communicated to any patients in the asylums and public institutions of this colony, &c. &c., and especially to inquire into certain cases referred to, &c. &c. . . . .

On April 28 we proceeded to Kaow Island, and on that day and the following were engaged in interrogating the inmates, the number of which was twenty-one. Out of this number fifteen declared positively that their parents were healthy and clean, three acknowledged hereditary taint, and three were not sure whether their parents were diseased or not. It will be found that most of these unfortunates cannot account for their present state; only two mentioned the possibility of the disease having been contracted by contact. The special case of the boy, L. L. L.,

pointed out by Dr. Cameron, would, to a certain degree, induce one to think that the disease was contracted by the intercourse which took place between him and the two sons of Mr. R. Z. E. The boy was healthy, and of healthy parents, and was in the best condition to acquire the disease, suffering at the time from an eruption of the skin.

On June 2 we proceeded to the asylum at Mahaica. . . . .

D., the man mentioned by Dr. Cameron, was very reticent in his answers. He is an Englishman, and his parents never left Europe, and were very healthy. There can be no question of hereditary tendency. He lived with a woman who had the taint, although she showed no symptom of the disease at the time of his intercourse with her. She died a leper, as well as a sister of hers, and a child she had by another man is now a leper in the Mahaica Asylum. This man said he underwent many hardships, and was very badly fed—principally on salt provisions. But we cannot altogether admit this as a cause of the disease ; we rather incline to the belief of its being contracted through his intercourse with the woman who proved herself to be leprous.

We have collected several reliable cases, which go far to prove the contagiousness of the disease which now occupies us. Besides, there are the cases adduced by Dr. Cameron, which we annex :—

Case I.—X. X .X., aged 15, white, a daughter of a clean, healthy, and wealthy family, in which leprosy taint had never appeared, was invited by a young friend of hers, Y. Y. Y., in whose family disease existed, but unknown too X. X. X.'s family. They slept in the same bed, and lived freely and intimately together. After three months Y. Y. Y. left her friends, and sometime afterwards the disease made its appearance upon her. X. X. X. grew up to womanhood, and married, and had children ; but after a few years of marriage the disease attacked her, and she died a confirmed leper. None of her family ever had the malady.

Case II.—T. T. T., a white man, of healthy and clean family, in which there was no hereditary taint, lived with a black woman, and had by her two children. This woman was perfectly clean, but her mother was a leper. Some time after T. T. T. became a leper, his two children also got the disease ; he died a leper, but the woman lived a long time without presenting any appearance of the disease.

Case III.—Another case, quite similar to the above, can be relied on as correct and to the point. A white man, who was perfectly healthy, as well as all the members of his family, lived with a black woman who showed no sign of leprosy, but in whose family the disease was prevalent. The man, after four years of sexual intercourse, broke out with the disease. A child of the connection was also attacked. The man and child died of leprosy, but the mother lived many years afterwards, before the malady made its appearance on her person.

Case IV.—A black boy, belonging to parents who had for generations been slaves to a family, enjoyed perfect health, and was perfectly free from any disease, as well as all the members of his family, which was a large one. This boy used to play and sleep with another boy who was not known to belong to a leper family. The boy who had the taint soon became a leper, and three years afterwards his playfellow also fell a victim to the disease. This boy is still alive.

Case V.—G. G. G., aged 25, white, of healthy and perfectly clean family, who

always enjoyed the comforts of life, visited a young man, with whom he slept, and with whom he was on the most intimate terms. This young man had leprous spots. After an intercourse of about a year, G. G. G. found spots on his person: soon after, tubercles made their appearance, and he died in a short time, a frightful object. The family of G. G. G. is at present free from all taint.

Case VI.—Q. Q. Q., white, aged 35, born in England, whose family never left Europe, and who lived comfortably, cohabited with a coloured girl. After two years he found out spots on his body, which were declared by medical men to be leprous. He had a child by this girl. He left for England, where he soon improved, the spots nearly disappearing. He returned to the colony and renewed his connection with this girl. He soon, however, got bad again, and returned to Europe, where he died a confirmed leper. The girl was found out afterwards to be afflicted with leprosy. A sister of hers died of the same disease, as also her child by Q. Q. Q.

Case VII.—A young boy of nine years, Z. Z. Z., coloured, has just broken out within the last three months with decided leprous spots. His family is perfectly clean and healthy, and live in good circumstances. About eighteen months ago, whilst suffering from a papular eruption, he used to go to his neighbour and play with a young boy, who afterwards was discovered to be afflicted with leper spots and a suppurating ulcer of the foot. None of the family of Z. Z. Z. are afflicted.

Case VIII.—A young Scotchman, whose parents have never left Europe, and whose family were as healthy as could be desired, met one night, whilst under the influence of spirits, a woman, with whom he had connection. This woman went the next day to ask him for some remuneration. He asked her what she wanted, and was shocked when she told him she was the person with whom he had had connection the night before. He beheld before him a woman far advanced in leprosy. He stated that from that day he lost all spirit, became languid and inert, and about ten months after, the leper spots made their appearance, and he ultimately died a confirmed leper. This case can be relied on as perfectly correct.

Case IX.—This case we cannot rely upon as well as the preceding one, but is very similar in its features. A young overseer coming home one night, met in the public road a black woman, with whom he had sexual intercourse. When offering her some money, she told him to put it into her mouth as she had no hands. He then perceived that she had lost her fingers, and in examining her more carefully found that she was a leper. This preyed on his mind to such a degree, that he was never afterwards the same man, always thinking upon this occurrence. He soon lost all energy and courage, and about two years after he became a leper, and died as such.

From most of the above cases, as well as those quoted by the different authorities we have named, it will be seen that while contact lasted there were no signs of disease on the party supposed to be the contaminating one.

If we are correct in attributing these cases to contagion, would we not be justified in stating that many of the cases that cannot be accounted for were instances of the disease being contracted whilst there was no appearance of the

malady on the contaminating party, and thus the persons afflicted with leprosy were not aware of the contamination, and denied its effects? In many cases the disease appeared long after the cessation of the supposed cause—contagion—and in those cases in which contact is denied, is it not possible, nay, probable, that at some time or other contact with an unhealthy person might have taken place without the disease being known to exist? The period of inoculation is very long, and it is difficult to positively state that persons who have resided in countries where the disease is endemic have not at one time been in contact with a leper.

As we have already stated, we have had little help from the medical men, and very little from other sources. In this colony very little attention has been given to leprosy, and hence the very limited information we obtained. Although the malady is not thought to be contagious by the majority of medical men, the people entertain a dread of it, and firmly believe in its contagion. There is always great care taken to separate the healthy from the unhealthy; and although they live together, much attention is paid to prevent contact as much as possible.

We must again express our regret at not being able to adduce more information than what we have done. Taking into consideration the cases here offered, and weighing carefully the opinion entertained by recent authorities, we think we cannot be considered wrong when we give, as our opinion, that leprosy in many cases is propagated by immediate contact; the term contact not being accepted in the ordinary sense of the word, but as meaning a protracted intercourse of the healthy and the unhealthy by which contact is produced by the inhalation by the healthy of the exhalation of the unclean, as well as the immediate juxtaposition of the parties by which diseased fluids may be inoculated from one to the other.

Statement by D. L. L., *a Leper of Kaow Island, made before Drs. Watt and Edge, Commissioners, Thursday, 29th of April,* 1875.

My father was a coloured man, a native of Guadaloupe, and my mother, also coloured, native of this colony, but of Dutch descent. They were both healthy. My father died from an injury he sustained whilst erecting a crane; mother died in the Colonial Hospital, Georgetown, from convulsions, in the latter part of the year, 1873. None of my relations, so far as I know, had the disease.

Before I became a leper I lived in Mr. X. P. B.'s yard with my mother, who washed the clothes of the family. I know that Mr. X. P. B. had a son who was a leper, and my mother washed his clothes also. This afflicted son never left his room, and I never associated with him or saw him about except at those times when I was sent to fetch his clothes. He simply put them at his door, and I took them up. I was about six years of age at this time.

On leaving Mr. X. P. B.'s yard we lived in Mr. P. Z. E.'s yard, in Lacytown, where my mother had the washing of the family. Mr. P. Z. E. had two sons, young men, who were both lepers; he had daughters also, but they were healthy. My clothes were washed along with the clothes of these diseased persons, and it is to this circumstance that I attribute my present condition, as well as to the fact

that I had an eruption of the skin—"prickly heat"—at that period, and wore those clothes. I was quite healthy before I came to live in this yard, and I do not recollect being subject to any particular sickness. I associated with the two P. Z. E.'s occasionally in the way of assisting them in their work. The elder of the two did a little carpenter's work about the yard. I never received anything in the shape of food from them.

I remember the visit of the Governor and Dr. Cameron last year. I had very recently come to Kaow Island. Dr. Cameron, as well as his Excellency, put several questions to me which I answered. What I have now stated I had previously stated to Dr. W. B. Pollard of the settlement.

On taking charge of the asylum, with a view to studying the disease of leprosy and to acquire some knowledge of the subject, I commenced taking notes of every fresh case admitted, and also of those patients whom I found inmates of the asylum on my resumption of the duties. As soon as I had got up to this number, I forwarded, in July, 1879, a paper to the Executive embodying the information entitled, "Notes of 188 Cases of Elephantiasis Græcorum," already alluded to, and which the Government deemed of sufficient importance to have printed. It is from these notes the following facts bearing on the propagation of leprosy are taken, and only the bare facts connected with the subject are mentioned, it not being necessary for this purpose to elaborate them.

The cases comprised 44 new cases, and 144 old inmates, taken in rotation from the general wards. Males, 172; females, 16; total 188, or—

Tuberculated cases	34
Mixed-tuberculated cases . . .	51
Non-tuberculated cases	103

Dividing the colony into counties there came from—

County of Demerara	105 cases
(Population 122,000.)	
County of Essequibo	37 ,,
(Population 35,000.)	
County of Berbice	46 ,,
(Population 35,000.)	

Places where more than one leper came from :—

County of Demerara.

Mahaica	18 cases.
Buxton, East Coast	3 „
Ogle „ (all Chinese)	3 „
Craig Village	5 „
No. 2 Canal	10 „
Grog Street, Georgetown	12 „
Kingston, Georgetown	6 „
Charlestown, Georgetown	9 „
Other places, Georgetown	10 „
Farm, East Bank	4 „
Hague, West Coast	5 „
Diamond, East Bank	3 „
Single cases from the County	17 „
	—105 cases.

County of Essequibo.

Island of Wakenaam	10 cases.
Island of Leguan	9 „
South part Arabian Coast	14 „
Single cases from the County	4 „
	—37 cases.

County of Berbice.

New Amsterdam	8 cases.
Everton and District	12 „
Skeldon	4 „
Foulis and District	6 „
Single cases from the County	16 „
	—46 cases.

Referring to the places from whence more than one leper came, it is at once apparent how considerably the grouped cases outnumber the single ones, nor will a study of the particular localities afford any clue as to the reason why one place should furnish more

cases of leprosy than the other. The largest number from any one place came from the district of Mahaica, where a large leper asylum has been established since 1858, the inmates of which have been permitted free ingress and egress. I have in another place given a list of forty-two cases in the same district, occurring outside the asylum, which, if the eighteen were added, would give a total of sixty cases of leprosy contracted in the immediate vicinity of this institution. Let the disease be propagated how it may, this is a pregnant fact, and forces the conclusion on us that the presence of the lazaretto, and the permission given to the unhealthy to mix with the healthy has something to do with the spread of the disease. It has been stated that Mahaica is one the healthiest parts of the country.

Of the 188 cases there were 31 in which a history of hereditary tendency was made out; there were 18 Chinese whose histories were incomplete, and in consequence omitted, which left 139 cases to investigate.

Going into the histories of the latter, I found one of apparently direct contagion among the following, given in fuller detail further on—viz., Cases 1, 2, 13, 14, 20, 21, 23, 26, 39, 51, 52, 54, 56, 57, 74, 78, 80, 82, 84, 88, 123, 127, 130, 135, 140, 142, 143, 145, 150, 154, 155, 158, 159, 160, 161, 163, 164, 165, and there was evidence that the following had been more or less in contact with diseased persons; they had either lived amongst or been in contact with lepers, as in Grog Street, Everton, Wakenaam, and in the case of two coolies from Pln. Helena, who lived together; three Chinese from Pln. Ogh, two of whom were admitted on the same day, with the same form of disease, living in the same room:—3, 4, 5, 6, 7, 10, 11, 12, 15, 19, 22, 24, 28, 34, 35, 36, 37, 44, 45, 46, 47, 48, 49, 50, 56, 60, 62, 64, 69, 70, 73, 75, 79, 81, 89, 92, 93, 98, 101, 121, 122, 126, 136, 139, 141, 146, 147, 148, 151, 152, 153, 156, 157.

We have, therefore, 92 cases out of 139, or 67·17 per cent., in which contact more or less prolonged, of the unhealthy with

the healthy, is given as the most probable factor in the propagation of the disease among them. In the original notes this passage occurs :—

In making use of the word contagion in connection with the disease of E. Græcorum, I am fully aware of the difficulties and the hostile criticism a writer on this subject must expect to meet in view of the authoritative decision thereon already given by so high an authority as the Royal College of Physicians of England. Nevertheless, a fair study of the disease, carried on for some time in the place where a thorough knowledge of the subject is most likely to be obtained, has so convinced me that I am constrained to make known my views and convictions, as it is only by the patient collection of facts by persons in charge of leper asylums that this matter will ever be finally settled. The object of the present paper is not a treatise on the manner in which leprosy is propagated, but to collect any facts bearing on the matter, and these I submit go to prove that, exclusive of hereditary tendency, the presence of a leper is frequently associated with an accession of fresh cases which cannot be accounted for by diet, locality, or general mode of living.

Synopsis of Cases.

No. 1.—Edward A——, male, native of British Guiana, aged 22 ; family all healthy ; has had non-tuberculated lepra eight years. This man lived with Goliah, a leper, at Supply Village, eating together, and sleeping in one bed ten years ago : within two years after leprosy appeared.

No. 2.—Thomas N——, black, native, aged 28 years ; four years diseased with non-tuberculated lepra. Admitted from Sister's Village, Berbice, November 3, 1874. Had small-pox and yaws at twelve years of age. Six years ago he lived with F. F——, at present an inmate at the asylum, subsequently cohabiting with a leper woman. All his family are healthy ; he is the only one of nine children affected.

No. 13.—Joseph F——, male, native, aged 64 years ; ten years diseased with non-tuberculated lepra. Prior to the appearance of the disease he cohabited with Ellen B——, subsequently admitted here a leper. His family were all healthy.

No. 14.—William J——, an African, male, aged 32 years. Admitted from Golden Fleece, five years diseased with nerve-lepra. Family free from all taint. Lived in the same house with a leper who has since died at the asylum.

No. 20.—Thomas D——, coloured native, aged 23 years ; seven years diseased with mixed-tuberculated lepra. All his family are healthy. Admitted from Zorg on April 11, 1872, where he and a leper named Aaron had occupied the same room.

No. 21.—Michael A——. (See Case III.)

No. 23.—This is the case alluded to by Dr. Cameron (p. 194), as D. (See the history as given in Dr. Milroy's "Leprosy and Yaws in the West Indies.")

Thomas S——, Englishman, aged 50 years, European parents, healthy family, not slightest trace of taint. Came to Demerara twenty-four years ago. Has had non-tuberculated lepra for twenty years. Attributes a predisposition through eating salt provisions. In 1855 he lived for twelve months with a woman whom he subsequently found was suffering from leprosy, in consequence of which he left her. This woman, her child, and her sister, died in the asylum.

No. 26.—James W——, African, aged 64 years ; twenty years diseased with nerve-lepra ; family all healthy. Admitted from Leguan on October 29, 1869. Not vaccinated ; had small-pox. At Amsterdam, Leguan, he lived in the same house with a leper.

No. 39.—William B——, black native, aged 32 years ; three years diseased with tuberculated lepra ; family all healthy. Admitted from No. 2 Canal, January 18, 1876. Not vaccinated, and had small-pox. Prior to his illness he cohabited with Minkey I——, who has since died here a leper.

No. 51.—Robert L——, black native, aged 30 years ; no family taint ; five years diseased with nerve-lepra. Admitted from Buxton on April 1, 1876. Not vaccinated ; had small-pox and syphilis. Lived at Buxton with William A——, at that time a leper, and since admitted also as an inmate.

No. 52.—John P——, Barbadian, aged 24 years ; family all healthy. Admitted September 15, 1876, with tuberculated lepra. Not vaccinated ; had small-pox. Believes he contracted the disease at Barbadoes by constantly visiting and staying with a friend there who was afflicted.

No. 54.—John B——, aged 19 years, black native; eight years diseased with mixed tuberculated lepra. Admitted January 4, 1874. He has played with a leper boy named "Johnny" as long as he can remember. None of his family ever had leprosy.

No. 56.—Digrooch (see p. 84) was employed at the hospital at Pln. Diamond, washing the clothes of some lepers there for some months.

No. 57.—Joseph P——, African, aged 34 years; fifteen years diseased with mixed tuberculated lepra. Admitted November 6, 1874. His family were free of leprous taint. At La Retraite he lived with one Bolus and his sister, both lepers, from whom he is convinced he contracted the disease.

No. 74.—Joseph F. C——. (See Case IV., p. 30.) In this case the disease was undoubtedly caused by vaccination. Dr. Tilbury Fox remarks:—"The inoculation of matter from a leprous sore—and this may occur in cohabitation and constant contact, *or in vaccination*—may give rise to the disease of leprosy."

No. 78.—Zachariah H——, black, W. I. islander, aged 40 years; thirteen years diseased with nerve-lepra; a sailor. Admitted 1870. All his family healthy. At Taymoth Manor, previous to his illness, he lived in the same room with Harry S——, a leper, the disease breaking out within a few months of this prolonged contact.

No. 80.—Robert J——, black native, aged 40 years. Admitted September 12, 1862, with nerve-lepra. Five years diseased. No family taint. He lived at Golden Fleece, prior to his illness, with two men suffering from leprosy.

No. 82.—Kullam, a coolie, aged 36 years. Admitted January 19, 1876. Mixed-tuberculated. Never heard of any relative being affected. At Haarlem he lived and slept in the same bed with a leper, and afterwards the disease broke out.

No. 84.—Konai, coolie from Madras, aged 23 years. Admitted February 1, 1875. Five years diseased with nerve-lepra. As far as he knows none of his family ever had leprosy. He cohabited with a leper woman named Josey, and within a year he got leprosy.

No. 85.—John P——, Portuguese; no family taint. Used to wash the clothes of leper patients at the Colonial Hospital, Georgetown, from where he was admitted on August 14, 1876, with nerve-lepra.

No. 88.—Lettoah, coolie, aged 37 years; five years diseased; not vaccinated; had small-pox and yaws prior to leprosy. Knew a leper at L'Union, at whose house he has frequently stayed.

No. 123.—Debideen, coolie, aged 37 years; ten years diseased. None of his family ever had leprosy. Admitted on July 19, 1869. Prior to his admission he cohabited, at Pln. Spring Garden, with Ankolia, who was then diseased, and is now an inmate of this asylum.

No. 127.—Cally Churn, coolie, aged 46 years. Has had yaws. Admitted with mixed tuberculated lepra, March 16, 1871. A female, Jumany, lived with him at Greenfield, Mahaica, at the time having leprosy. Jumany herself is now at the asylum with advanced mixed tuberculated lepra.

No. 120.—Ojazeer, coolie, aged 31 years; not vaccinated, and had small-pox. Admitted July 19, 1872. At Coffee Grove he was intimate, and associated frequently, with several lepers, but particularly Amarally (No. 19), with whom he lived in the same room. No family taint.

No. 130. Mooderay, Madras coolie, aged 50 years. No family taint; ten years diseased. Admitted January 6, 1872. At Enmore he lived with a black man, a leper, eating, sleeping, and fishing together.

No. 135.—Madoll, coolie, aged 56 years; not vaccinated; had small-pox and syphilis prior to leprosy. Never heard of any of his family having had the disease. He lived in the same house with two Chinese lepers (Nos. 111 and 116) at the Farm; he is very intelligent, can read and write. and is firmly convinced he contracted the disease through this intercourse.

No. 143.—Margaret Mc——, aged 18 years, black native.

Admitted September 12, 1875. Margaret's family are all healthy. Her aunt married Orion M——'s brother (Case XXXVII.). O. M. is an inmate of the asylum, and our patient visited the asylum with her, staying a week at a time in M.'s quarters at the Leper Asylum. Subsequently Margaret developed leprosy.

No. 145.—Mary Y——, white, European parents, but born in Demerara. Admitted, aged 14 years, with non-tuberculated lepra on April 4, 1877. Her parents died free of all leprous taint. This child was put out to nurse with a Mrs. Osborn, at Pln. Success, Leguan, who wet-nursed her. Mrs. Osborn was afterwards found to be suffering from leprosy, and her two children died inmates of the Leper Asylum, Mahaica.

No. 149.—Seraphina C——, aged 21 years, brother to No. 94 ; vaccinated at the same time with the same lymph.

No. 150.—Henry S——, admitted December 12, 1877 ; family all healthy. Knew intimately several black women who were lepers, although he denies any closer intimacy. Was very intimate with one "Will," a well-known leper.

No. 154.—Poynee, coolie, from Madras. Admitted from Pln. Hope, E.C., February 11, 1878, where he lived with Besessur and Kurumatally, both lepers.

No. 155.—Trim L——, whose family were free of all leprous taint, lived at Gibraltar, Berbice, with three lepers (no relatives of his), named Borman Frederick, S. Somersall, and Rebecca Guiana.

No. 158.—Wing a Pan, lived with a diseased countryman (Chinese) at Anna Regina, in 1874. He was admitted in 1878, then three years diseased with tuberculated lepra.

No. 159.—Henry W——, aged 19 years ; three years diseased with tuberculated leprosy ; Asia T—— (Case IX.), at present an inmate, and he were playfellows ; Henry at the time was healthy, and his family free of leprous taint.

No. 160.—John H——, an African ; one year diseased. Admitted from No. 2 Canal, on June 24, 1878, with tuberculated

lepra. No family taint said to exist. Has had yaws. He lived with two lepers at No. 2 Canal—viz., *William H*——, no relation whatever, and a black woman named *Catherine*.

No. 161.—Samuel B——, a Barbadian, aged 49 years; five years diseased with nerve-lepra. No family taint. At New Amsterdam he cohabited, being at that time in fair health, with Rebecca M——, then suffering from leprosy.

No. 163.—Le a Kit, Chinese, aged 39 years. Admitted from the Pomeroon* on January 24, 1879, with non-tuberculated lepra. Family all healthy, and patient is a particularly intelligent man. He says it is commonly remembered at the Pomeroon how leprosy was introduced there at the time the lepers were sent to that place. These lepers intermixed with the aborigines, whose descendants in many instances are now lepers. Le a Kit contracted the disease by cohabiting with a leprous Boviander woman. He had lived with a pure Buck† woman, and was quite healthy until he went to live in concubinage with the former.

The cases brought forward to illustrate the clinical characters of leprosy nearly all have a history of the disease having been contracted through contact with the unhealthy, indeed, they were specially selected from among many others as pointing to this mode of propagation of the affection. The investigations of Carter, Hansen, Neisser, Thin, and Gaucher on the Bacillus leprosus, and the evidence herein collected in support of the contagion theory, are, I submit, of great weight; and medical authorities are gradually coming round to the opinion that the disease is a contagious one, and that we are justified in so regarding it; at any rate it shows that, in the minds of many competent observers, the matter is far from settled, and that a policy of non-isolation or non-segregation is calculated to exercise an amount of harm which cannot but be regarded with horror by those whose duties lie among these unfortunates, and who daily see so many persons

* See account of introduction of leprosy at the Pomeroon, on page 160.

† The aborigines are termed "Bucks."

becoming infected through what I cannot help characterizing as a mistaken notion as to the nature of the disease.

4. *Vaccination.*

I have already given some cases in which there could be no reasonable doubt but that the disease was produced by vaccination with tainted lpmyh. Those of the brother and sister mentioned on p. 30 are conclusive on the point, and we have the testimony in favour of this mode of propagation from such men as Tilbury Fox and Erasmus Wilson. I will therefore conclude this chapter with a case from the work of a recent writer, Dr. Piffard, of New York.*

Case III.—Wm. T——, aged 25 years, was admitted into Bell Hospital in May, 1864. He was of English parentage, but was born and passed his early life in British Guiana. After a vaccination performed when young, his arm became greatly swollen and inflamed and large sloughs separated. Investigation revealed the fact that the vaccine virus had been taken from a negro whose mother was a leper. At the age of seven years some brownish spots appeared upon his back and arms; and at the age of eleven a blister formed on the palm of the right hand, followed by permanent contraction of the flexor tendons. A few months later he felt a tingling sensation around the nail of the right index finger, followed by a line of suppuration and loss of the nail. The finger soon healed, but the same morbid process separated itself in the other fingers of the same hand. After a few months, according to his statement, the skin of the distal phalanges split, and the flesh shrank away from the bones, leaving them exposed. The bones separated at the joints and the stumps healed. These various processes occupied eighteen months or two years. The disease then affected the distal phalanges of the left hand in the same manner. After this it attacked the right foot and a slough formed over the lower part of the instep. The great toe then became swollen, the skin split, and its distal bone separated, then, without much regularity, the remaining phalangeal bones of fingers and toes necrosed and came away.

On examination the patient was found to have maculæ or leper spots, and anæsthesia of the parts affected.

* "Diseases of the Skin," p. 209.

CHAPTER V.

Treatment of Leprosy.

The treatment of leprosy has hitherto been attended with such very poor results that the disease is now regarded as incurable Drug after drug—so called specifics—have been tried, only to be laid aside as useless, the disease after a time returning with greater violence than ever. In Galen's time the treatment consisted in "keeping the skin soft and moist with oily applications, suitable exercise, &c., particularly swimming." It is worthy of remark that at the present day lepers are fond of using grease wherewith to anoint their skins, and in some asylums barrels of mill grease are requisitioned for this purpose. Collins thought he could cure leprosy in its early stages; but the earliest systematic treatment of the disease was carried out in 1850 by Dr. Danielssen at the Lungeguard's Hospital, Bergen, the results of which are given in the Norse Magazine for Medical Science,* from which I have obtained the following particulars:—Seventy cases were treated—viz., Tuberculated, 50; Non-tuberculated, 11; Mixed Tuberculated, 9. Out of this number only one was reported cured; three left improved; five left without any benefit from the treatment; and four died. The treatment was based on the theory that in leprosy there is an excess of albumen and fibrin in the blood, and vegetable diet, steam baths, phosphoric acid, tartrate of antimony, iodide of potassium, chlorine, &c., were ordered. In the non-tuberculated cases the ferri iodidum was prescribed. During the febrile paroxysm nitre was administered, and sometimes venesection resorted to, and in the following year a trial was made of oxalic acid. In 1857 syphilization as a cure of leprosy was next tried by the same authority. At page 2 of his monograph on the subject† he

* *Norsk Mazagin for Lægevidenskaben*, 1852. Heft 1-10.

† "Syphilizationem anvendt mod Syphilis og Spedalskhed," ved D. C. Danielssen.

states :—" It appeared to me, however, if I could infect the leprous patients with constitutional syphilis, it might follow that the syphilitic poison might prove superior to that of leprosy, and that thus the system might be brought to that of a person labouring under constitutional syphilis, and might so become subject to the ordinary process of syphilization." This ingenious theory, however, failed in practice, the leprosy remaining unchanged whilst the syphilitic process went on.

Nerve stretching has been tried,* and with some degree of success; it is my intention to test this remedy combined with Gurjun oil treatment, for when the nerve is so diseased that the procedure might be tried with any degree of success, there will assuredly be deposit elsewhere in the system which will require removal.

In the *Medical Times and Gazette*† there is, in those interesting " Letters from Madras," some account of the treatment of leprosy at the Leper Hospital, Madras, where the following remedies, among others, were resorted to:—The Asiatic pill, a reported specific; Fowler's solution, and the iodide of arsenic; Donovan's solution; hydrocotyle nigra, and Chaulmoogra oil, the latter said to be the active ingredient in Dr. Dhan Dajees' secret preparation; carbolic acid, and phosphate of lime. With the exception of Chaulmoogra oil, the above were found to be merely palliative.

To come now to the treatment adopted in the West Indies, and more particularly British Guiana, it is only right to state that the latter colony has been foremost in voting money for investigating methods of treatment likely to relieve or cure leprosy. The Beauperthuy treatment was introduced by Dr. L. D. Beauperthuy, of Camana, Venezuela, a highly qualified physician, who visited Demerara on the invitation of this Government, and carried out his treatment at a place called Kaow Island, Rio Mazaruni, where a few lepers are to this day located. It is thus referred to

* *Brit. Med. Journal*, Feb. 19, 1881. *Lancet*, Feb. 26, 1881.

† Vol. i. 1874, p. 422.

by Dr. Bakewell in a letter to Earl Granville, K.G. (para. 69 *et seq.**) :—

Dr. Beauperthuy's plan of teatment combines these two objects. By a careful diet, by hygienic precautions, by daily baths, and by the administration of suitable medicines, he seeks to subdue the blood poisoning, and to restore that fluid to a healthy state. His system is briefly as follows:—Residence in as salubrious a locality as can be procured; diet nutritious but not stimulating, containing a daily portion of fresh meat, but no pork or salt fish, or salt meat, wine (Bordeaux) in moderation, if the patient has been accustomed to it; attention to all the ordinary hygienic rules. The medicine he used to administer was the bichloride of mercury in small doses. The external applications he makes use of are certain liniments, of which a very useful one contains balsam of copaiba, to cure the eczematous and other eruptions so common in leprous patients; and, for the active removal of tubercles, either a strong solution of nitrate of silver and copper, formed by dissolving silver coin in concentrated nitric acid, and adding an equal bulk of distilled water, but principally by the use of the *oil of cashew nut* (*Cunacardium occidentale*).

The oil of cashew was applied with a sponge, and sometimes a needle dipped in it would be used to puncture a tubercle, say, on the ear, in order to set up suppuration. It should be mentioned, that the author did not profess to cure leprosy after it had invaded the internal organs.

Dr. Beauperthuy died at Kaow Island whilst engaged in carrying out his method of treatment. It subsequently had a fair trial by the several surgeons attached to the Penal Settlement, and I have also tried the remedies he suggested at Mahaica, but beyond some amelioration of the symptoms, nothing has resulted to justify the expectations that at the time were held out concerning it. I cannot, therefore, recommend it; it is founded on a wrong theory, and the dispersion of the tubercles may be obtained by other and less cumbrous means. The treatment has been reported against by Dr. Gavin Milroy, who specially visited Kaow Island. It has been tried in Bombay and Madras, and abandoned. In Norway, Danielssen records his opinion against it, as "failing to attack the dyscrasic condition of the blood." The following is an official report to the Government on some of the cases in which it was resorted to originally :—

* Parliamentary Paper, Colonial Office.

Report on Cases under the Beauperthuy Treatment.

Apparent Condition of Lepers when examined by Doctors Manget and Shier, 12th May, 1873.	*Apparent Condition of same cases when examined by Doctors Cameron and Pollard, 28th April, 1874.*
1.	
This patient is greatly improved in appearance, he states that he feels well, is in better spirits and can do a little work.	This patient is not improving, but apparently becoming worse. The hypertrophy is reappearing in several places and activity nearly gone.
2.	
This patient is considerably improved, He is able to work a good deal.	This case seems to remain stationary, there being no change of appearances on the surface. His vigour and activity are considerably less than they were some months ago.
3.	
There is apparently a slight improvement in this patient's condition. He is capable of doing a little work in garden culture, but seems little inclined.	This case remains quite stationary, there being no change observable for the better or the worse.
4.	
This patient has made considerable improvement. He thinks were his foot better that he would be able to work.	This case has not improved in any way since last inspection. Ulcers on heel and toe are not improved by battery, nor is the contraction of the toe improved.
5.	
The ulceration on the sole of left heel is still there. It has been healed from time to time but has broken out again. Considerable improvement has taken place in this case. He is able to do a little work, when the sore was healed he could do a good deal of work.	The sore on foot became very large and bad. — Since the application of galvanism it is healing up but does not present a healthy appearance. Sensibility of legs increased since the battery has been used; as he believes that this will effect a cure, his spirits are better.
6.	
There is now a sore in sole of right foot and one under great toe of left foot. Anæsthesia has disappeared from all parts of the body except the hands and feet and lower part of the legs. The patient thinks the sense of touch is less in his legs than when he was admitted. In some respects the patient appears	This man has been at Kaow Island for a considerable time, and his general health has improved. He suffered greatly from articular pains. Since the application of galvanism they have completely left him. His sores have healed from the same application, and the anæsthesia of hands,

improved. He is able to do a good deal of garden work.	feet and legs so much improved that he wishes to leave and resume his trade as a cooper. The benefit of galvanism has been very marked in this case.
7.	
Fingers remain contracted. Ulcer on outer edge of left foot remains. Anæsthesia seems confined to elbows, hands, legs, and feet. No manifest improvement except recovery of sense of touch in certain regions.	Battery has had no effect on this case. He is becoming slowly worse in every way. Sore open and offensive. Hypertrophy general.
8.	
Hypertrophy of the integuments of the feet is still considerable. The tubercles on heel are much reduced in size; anæsthesia generally is very much reduced. This patient presents decided appearances of improvement. The disease has certainly made no progress. The patient states that he feels better in every respect.	All the apparent improvements in this case have disappeared. Anæsthesia and tubercles have returned. Treatment has done no good, and he is rapidly becoming worse. Galvanism of no avail hitherto.
9.	
Tubercles have almost disappeared from chest and back. Sensation of touch has returned to face, neck, and ears. Sensation has returned to arms and forearms, buttocks, back, and inside of thigh; has a sore on great toe of right foot, also a crack on sole of same foot. This patient made considerable progress until a large abscess formed in right hand, extending to wrist, from pressure in handling carpenter's tools in making a box.	This man remains pretty much in the condition described, and if anything he is worse now than when last reported on. The galvanic battery has done him no good.
10.	
Tubercles on all localities are much reduced in size. The spots have in parts disappeared. Hypertrophy of the integuments in various localities slightly reduced. Ulceration of the third toe of right foot has healed up. The anæsthesia is pretty much the same as on admission. It has certainly not increased; very little can be said of this patient. He himself thinks that he is better and stronger than on admission.	This man continues much in the condition described. He states that his strength is failing, and that he does not feel when touched so well as formerly. He will probably break down suddenly.

11.

Anæsthesia complete in elbows. Sensation of touch recovered on back of forearm, back of thighs, and outside of right thigh. Left knee and front of ankle anæsthetic, while sensation has been recovered on outside of legs.

The general health of this patient has not deteriorated since reported upon, but there is no improvement in his condition. Sensibility has if anything decreased.

12.

Tubercles still remain in both ears, but they are reduced in size. The same may be said of the tubercles on face. General hypertrophy of skin still observable. General health very much improved.

There is no improvement observable in the case of this man. The sick nurse states that he cannot do the same quantity of work as a year ago. His general health is beginning to fail. Tubercles remains just as described.

13.

Face not quite so tuberculous. Spots on chest, abdomen, and back not so apparent as before. Tuberculous spots on arms, forearms, and hands are not so apparent as on admission. The two tubercules on right forearm have all but disappeared. The hypertrophy of the skin of hands is much the same. The spots on buttocks and thighs are pretty much the same.

The condition of this man is very much worse than it was in April, 1873. Tubercles and anæsthesia have increased, the former being more numerous. There is hardly any hope of amelioration in his case.

The above are all the cases seen by Drs. Manget and Shier that I found on Kaow Island on the 28th of April last: of the others under treatment there, with the exception of one named * * * , there is nothing to be said, as they had been too short a time under treatment.

* * * admitted December 4, 1873. Native of Dominica. Had been a soldier, and was discharged in consequence of his having leprosy. Yellow spots first appeared nine (9) years ago.

Since his discharge he worked as a wood-cutter, and continued to do so until within a month of his admission. He then suffered severe pains in all his joints, which were quite stiff.

His fingers were stiff, painful, and contracted. By the use of the galvanic battery the pain in joints has quite gone, and his fingers have recovered their elasticity so far that he can play the flute very well. He had been a bandsman, the fife being his instrument.

(Signed) ALEX. G. M. CAMERON, M.D.

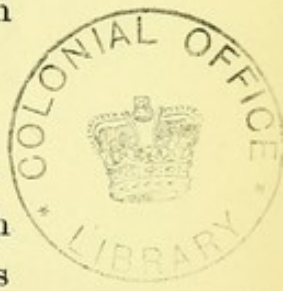
Special Commissioner for Visiting Leper Asylums.

Palliative Treatment of Leprosy.

Although a satisfactory and certain cure for leprosy has yet to be obtained, I think the probability of being able, through the resources of medicine, to help these unfortunate sufferers should not be lost sight of. With regard to my own experience, I cannot go the length of saying that all treatment is unavailing at all events to arrest the disease, for at the asylum under my care much good has been done by judicious remedies. I have chronicled cases which look as if a cure had been effected, but until some further time has elapsed, and other opportunities for investigation have been availed of, it would be premature to pronounce positively on them.

Improving the sanitary condition of the leper, it is well known, has great influence in mitigating the disease, and the satisfactory results which have been realized in this direction at the General Leper Asylum may be seen in the following figures, taken from my official Report for 1878, where the percentage of deaths to strength for the past four years was stated to be :—

1875	1876	1877	1878
17·36 per cent.	16·33 per cent.	11.49 per cent.	9·19 per cent.



Cleanliness, a matter of so much importance, particularly in such a disease as leprosy, is ensured by the constant use of various baths; those at present in course of erection will not be excelled in any similar institution. Every inmate, unless otherwise ordered, is made to take a sea-bath every morning, the asylum being on the sea-shore. The baths most frequently in use are cold, hot water, steam, and sulphur; the number of lepers with itch necessitate a frequent use of the latter, and sulphur baths moreover lead to a healthy action of the skin. During the febrile paroxysms in T. L. the hot water or vapour bath is in constant requisition, with the best results, and as adjuncts in the treatment of the anasarcous complication. The most scrupulous attention is paid to the enforcement of sanitary regulations,

including proper drainage, a matter of importance, especially in low-lying lands, and every inmate has at least 1,500 cubic feet air space, the minimum I would allow in tropical asylums. Turkish baths are necessary and useful in the treatment of leprosy. The extensive ulcerations so common among lepers are a source of annoyance, disgust, and ill-health, unless properly managed, the horrid fetor pervading the entire establishment.

The ulcerated surfaces are very extensive—may take over one-half of the body—and it becomes a serious consideration what dressing, regard being had to cost and quality, is best calculated to do the most good. I can confidently recommend well-picked oakum as one of the best applications I have met with; its use has entirely done away with the overpowering fetor I had to contend with at the asylum, and it is very cheap, a few pence per pound. Applied over a piece of medicated lint it forms a soft dressing which is absorbent and disinfectant.

As a local application for the purpose of healing the ulcerations or lessening the discharges from the unhealthy granulations which so weaken the patient, I employ the following :—

(1.) Lotion of sulphate of copper, 4 grs.—℥j.

(2.) Lotion of carbolic acid, 1 in 40.

(3.) Iodoform ointment, made with 20 gr. of iodoform to ℥j of benzoated lard.

These are applied on either lint or tow, and over all a compress of oakum, this secured with a bandage.

Tonics and good diet are at the same time ordered.

When the exhaustive effects of the discharge become severe, the strength must be supported by nourishing diet, stimulants, &c., together with the free administration of opium combined with small doses of quinine ; except in these cases, and in long-standing lung affections or pneumonia, which is frequently of a typhoid type, stimulants do more harm than good in leprosy. The tonic I am in the habit of exhibiting is simply tr. ferri mur. and infusion of quassia ; sometimes cod-liver oil, sometimes arsenic in combination

with iodide of potassium. Beyond a slight improvement in the general health, no good effects were derived from these drugs, or from 10 gr. doses of quinine, as suggested by the late Dr. Tilbury Fox. To recapitulate, then, with a view to the palliative treatment of lepers, the first consideration is to place them in the best possible condition for health; when it is practicable removing them from malarial districts to a temperate climate ; even removing them from the place where the disease prevails seems to do good. An equable temperature, dry and bracing, is beneficial in the early stage, and if the patient is a West Indian, ordering his removal to Europe. With regard to removal to a cold climate—a question which sometimes arises, Dr. Liveing agrees with me that it is advisable, but there is the authority of Dr. Carter against it, who instances the severity of Norwegian leprosy. In two cases I was instrumental in sending to England improvement took place in both; certainly it appeared to me that the good effects of a bracing non-malarious climate, would more than counterbalance any tendency to chills and exposure. The larger number of deaths, however, that occur at a change of season, proves how injuriously dampness, or a variable climate, is likely to influence the condition of the leper.

With regard to asylum cases, some healthy out-door occupation to take away their minds from dwelling on their condition, and to arouse them from apathy, is beyond all necessary. With respect to diet, reference has been made to the supposed influence of a fish diet. I stated that I have not found fish hurtful when properly prepared and of good quality, nor do I consider it ought to be eliminated from the leper's dietary.*

Fresh meat, milk, and vegetables are of great importance. Oily food, it is stated, aggravates the disease, while in Norway an exclusive meat diet exercised no appreciable influence on it.

* It was reported by the Commissioners appointed to examine cases at Kaow Island that:—"Salt provisions are rigidly excluded from the dietary scale at Kaow Island, and yet no benefit resulted from this restriction. It appears, therefore, that the evil influence of salt fish as an exciting cause of leprosy in this colony, has been rather exaggerated to to say the least of it" (Official Paper).

Flannel worn next the skin is of value in keeping up an equable temperature in a climate where people perspire so freely, and it relieves the feeling of cold. I attribute much of the improved health of the inmates of this asylum to the fact that every leper physically capable is made to indulge in some industrial occupation, light, useful, and suitable to his condition, for so many hours morning and evening. Indolent habits, careless use of spirits and tobacco, it need be hardly said, intensify the sufferings. Opium eating, to which Asiatics are addicted, is likewise attended with disastrous results. Next, I would place, as a remedial measure, segregation of the affected in separate asylums. The good results that have followed segregation where it is in force is a sufficient answer to those who consider no restriction should be placed on these cases.

With regard to the specific treatment of leprosy the only medicines from which I have derived any benefit are the Gurjun and Chaulmoogra oils. Before proceeding to consider the latter, I may incidentally mention that only Gurjun oil is now used at Mahaica, after a fair trial of nearly every other recorded remedy.

Mercury in any shape or form in the treatment of leprosy has only to be mentioned to be unhesitatingly condemned.

Chaulmoogra Oil (*Hydrocotyle Asiatica, Ginocardia Odorata*).—This drug has been employed in India with apparent success, and the following testimony in its favour is contained in Dr. Carter's work :*—

> Under the prolonged and continuous use of this oil, the progress of the disease is arrested, the skin becomes soft and supple, the discolorations vanish, the different morbid sensations leave the patient, the mental hebetude passes away, the impaired sensibility is completely or partially restored, the ulcers heal and cicatrise, though ever prone to break out again, and the general nutrition of the tissues improves; patients crippled before being known to walk about unassisted, and to gain in strength and weight. . . . . In the space of less than two months perceptible changes in the disease and in the state of the patient become observable;

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* "Leprosy and Elephantiasis," p. 198.

this having advanced favourably to the degree above mentioned, in most cases becomes stationary, and does not seem to be promoted by a prolonged use.

It is necessary for the above success that the disease should be recent, the patient's general health good, untainted by scurvy or syphilis, and that the disease be not hereditarily acquired. It is further mentioned that the tuberculated was more amenable, the mixed next, and the non-tuberculated the least amenable of all, but no absolute cure was ever said to have been effected.

I have been thus careful in stating the Indian experience of this drug for the purposes of comparing the results with those obtained by me from its use, which will be better understood by the enumeration of one or two cases in which it was employed, and not only to test the merits of the drug, but to compare the effects with those of Gurjun oil. In administering the Chaulmoogra I commenced with a dose of ten minims in emulsion with milk, or sometimes castor oil, and externally a liniment of one part of Chaulmoogra and fifteen of sweet oil was used.*

CASE L.—*Non-tuberculated Lepra. Great Improvement under the use of Chaulmoogra Oil.*

C. M. H., aged 9 years, whose history and symptoms are described as Case XXVIII. There is an eruption which has discoloured nearly all the body; contraction of the fingers, ulcers on the fingers, toes and underneath the foot; anæsthesia of hands, forearms, and feet, and to a less degree over the leprous patches.

Ordered September 10, 1879.—A liberal diet, containing fresh meat, milk, and vegetables, on which régime he had already been for some time without any improvement, and Chaulmoogra oil, eight minims in emulsion with milk three times a day after food. The usual sea-bath in the morning was also ordered, and externally the following liniment to be applied to the affected parts:—Chaulmoogra oil, 1 part, olive oil, 15 parts.

* Dr. Robert Liveing has published six cases, Mr. Wyndham Cottle two cases, and Dr. David Young, of Florence, a series of cases of true leprosy, in which decided benefit was derived from the use of this drug.

September 17.—No change. Continue.

September 24.—No change; his bowels have been moved twice a day.

October 1.—Looking in better health. No perceptible change in the disease. Dose increased to ten minims three times a day. Continue the liniment.

October 7.—Dose increased to fifteen minims; no constipation.

October 14.—Ol. ricinum added to the Chaulmoogra.

October 21.—No change. Dose increased to twenty minims.

November 10.—Admitted into the Infirmary on account of the extension of the ulcer underneath the foot. All the ulcers dressed with iodoform ointment, and the medicine continued ♏ xx. ter die.

November 24.—The eruption seems to have faded slightly; the loss of sensibility is not so marked; the ulcers have healed, except one under the left foot.

December 8.—Improving.

December 22.—Improvement continues.

Examined January 2, 1880.—A great improvement in the general health has taken place. All the ulcers are healed, but the eruption still remains, and the glands in the groin are yet enlarged.

Finally the symptoms were merely alleviated. There was a strong suspicion of hereditary taint, and in my experience these cases and those in which leprosy has succeeded small-pox, syphilis, or yaws, are the most difficult to treat.

Since the above was written I have administered this oil in my private practice in the form of "perles," but without much benefit.

CASE LI.—*Mixed Tuberculated Lepra of two years' duration, treated with Chaulmoogra Oil. Improvement.*

Wm. A. L——, aged 14 years; born in Demerara of negro parents; father is dead, mother alive and well; no suspicion of hereditary taint in either. He has lived in the midst of a number

of lepers who congregate and reside behind the Georgetown Jail. He was never vaccinated; has had yaws. There are tubercles on the forehead, eyebrows (where the hair is intact), on the alæ of nose, cheeks, helix of each ear, and on the lips and chin. The neck is free from the disease. There is the characteristic mottled condition of the skin. There are clear-looking tubercles on the nates, elbows, and fingers, giving the latter a shiny, cracked, œdematous look; in some places the tubercles are ulcerating. The glands are enlarged in the groins, forming two good-sized tumours. The legs and hands have a scabby appearance; both feet are ulcerated, and he has lost his little toe. There is a characteristic ulcer under the left foot, and tubercles in front of the knee-joints. The feet and legs are anæsthetic, and there is diminished cutaneous sensibility over the matured tubercles.

He was ordered, on September 8, 1879, a liberal diet with fresh meat, sea bath, and eight minims of the Chaulmoogra oil, three times after food; and one drachm of Chaulmoogra oil, in a liniment, to be rubbed into the left cheek only, morning and evening.

September 13, 1879.—Tubercles on the left cheek seem less prominent. Continue the same dose internally, and rub into three large tubercles on the forehead a drachm of the oil as directed for the cheek.

September 22.—The tubercles on the face are decidedly less prominent. Treatment continued. Half an ounce of the oil, in liniment, to be rubbed into all the tubercles daily.

September 29.—The oil vomits and purges him, but he feels much better; face more natural, tubercles rapidly disappearing; sensation returning in some of the benumbed parts.

October 6.—Appetite improving; extra milk ordered; improvement continues, but slowly. Dose increased to ♏ xv morning and evening.

October 13.—Had dose of castor oil yesterday.

October 20.—Improving. Had dose of castor oil

November 10.—Great change for the better. Tubercles have disappeared from the forehead; those on the alæ of the nose and cheeks nearly gone; they have disappeared from the nates; the fingers are more natural. Dose increased to ♏ xxx ter die, and externally to be rubbed, in the form of liniment, 1 oz. of the oil daily.

November 24.—He has feverish symptoms to-day, worse during last night. There are reddish blotches over the face and body, and he was sent to the Infirmary and ordered baths, salines, and diaphoretics.

November 30.—A fresh development of tubercular patches has occurred; the fresh tubercles are small, like minute papules, but they are firm on pressure, and only a drop of blood exudes when they are punctured.

December 15.—He is subject to febrile exacerbations. There are red, raised patches of infiltration on both cheeks, shoulders, and the left side, in some places not unlike urticaria. On the abdomen small tubercles may be seen appearing.

December 22.—Resumed the Chaulmoogra oil treatment as last ordered.

January 9, 1880.—This lad has greatly improved. Many of the second crop of tubercles have subsided, and the skin is almost natural. The enlargement of the glands in the groins, however, continues, and there are a few small tubercles still on his body.

June 20, 1880.—He still takes the Chaulmoogra oil occasionally; his condition is the same as reported on last date.

Gurjun Oil (*Wood-oil from the Dipterocarpus lævis*).—At the General Leper Asylum, and in my private practice, important results have been obtained in the treatment of leprosy by the use of Gurjun oil or balsam. This remedy was first brought prominently before the profession in a pamphlet by the late Surgeon-Major J. Dougall, M.D., Officiating Senior Medical Officer, Port Blair,

Andaman Islands, "Report on the Treatment of Leprosy with Gurjun Oil," printed at Calcutta, 1875. Dr. Dougall had two emulsions of this oil made with lime water :—

(1.) Lime water, 3 parts.
Gurjun oil, 1 part.
(2.) Lime water,
Gurjun Oil, equal parts.

The former for external, the latter for internal, use. At page 6 the plan of treatment is described as follows :—The lepers were bathed every morning, using dry earth well pulverized as a detergent, so as to rub off the previous day's inunction ; afterwards taking internally ½ oz. of the No. 1 mixture. No. 2 was then rubbed in for a couple of hours, and at 3 P.M. the same system was adopted, and the same dose administered. Dr. Dougall gives the details of twenty-five cases of leprosy treated in this way, which were followed with good results, and at page 14 he states :—

The duration of the present investigation was arbitrarily limited by myself to six months for no other reason than that I wished to get this Report out of hand, &c. The time has been long enough to show that leprosy, both tubercular and anæsthetic, can not only be arrested, but the condition of the lepers can be greatly ameliorated ; and men here who have not for years been able to do more than drag out a miserable, helpless existence, are now able and willing to work, and every sore is quite healed. In some instances the sores have been healed up for more than three months and show no tendency to re-open; and these desirable results have been attained simply by the use of Gurjun oil and lime water, substances which are so cheap as to be within the reach of all. No change whatever has been made, even to the most minute particulars, in regard to the diet of the lepers from what they have been getting for years past, and they get their fish four times a week as usual.

In the *Medical Times and Gazette*, June 27, 1874, there is a letter from Dr. Dyce Duckworth stating that improvement had taken place in a case of leprosy under the internal and external use of Balsam Gurjun; and in the same periodical for November 21, 1874, this passage occurs in regard to it :—

The President in Council invites the co-operation of all local governments, and administrations towards the extension of this *valuable medicine*, and requests that

careful reports on the results may be submitted at the end of the year for the information of the Government of India.

Gurjun oil has been tried at the Trinidad Leper Asylum by the Superintendent of that institution, and the result submitted in his Report.* Dr. Espinet gives details of, among others, two cases :— (1.) One of mixed-leprosy, in which there was "subsequent general improvement with return of sensibility on resumption of treatment," and (2) one in which there was "notable amelioration after six months' treatment." Dr. Espinet concludes his report with the statement, that "among the eleven patients, therefore, submitted to the Gurjun oil treatment, only four followed it up regularly, but all four have improved both as regards their leprous symptoms and general health."

I commenced the treatment of leprosy with the drug in March, 1877. Careful records have been kept of all the cases so treated, and the result submitted from time to time in official reports to the Government. I can claim for Gurjun oil that, given a suitable case, the disease can be arrested by it, and that in a few instances there has been no return of the disease for over two years, but it may nevertheless be premature to say a cure has taken place.

The following notes are taken from the Appendix to my Report on the Leper Asylum at Mahaica for the year 1877, printed at the Royal Gazette Office (official), Georgetown :—

CASE LII.—*Mixed Tuberculated Lepra, greatly benefitted by Gurjun Oil Treatment.* (For details, see Case XXXIX., p. 131.)

J. A——, black native, aged 30 years ; not vaccinated ; has had yaws, small-pox, and measles.

Present State.—Tubercles on the forehead, cheeks, lips, and ears. Non-tuberculated spots, mutilation of the hands and feet, anæsthesia from, and including, the fingers to the elbow joints ; hypertrophy of legs, disease of nerves, nasal voice from implication of the

* "Report on the Employment of Gurjun Oil in the Treatment of Leprosy at the Leper Asylum, Trinidad.' By J. Espinet, Med.-Supt. 1876.

mucous membrane, enlarged breasts and femoral glands. No internal complication, bad appetite, sleeps indifferently.

Ordered March 20, 1877, the ordinary diet of the asylum, and to commence the Gurjun oil treatment ; two drachms of the mixture for internal use night and morning, and frictions twice in the day with the other.

During the next two months the patient followed the treatment pretty regularly, stopping two days in each week when the purgative effect of the drug became severe.

July 15, 1877.—He has followed up the treatment, but has been greatly troubled with a severe stomach pain after taking the oil, which, combined with severe purgation, made him feel very weak and refuse his food. He is now, however, beginning to experience benefit, and asks for more food. Ordered an increase to his diet.

September 14, 1877.—Feels stronger, and is satisfied the medicine is doing him good. He can now take it more regularly, having only omitted ten days since last date. He has up to this taken seventeen ounces of pure Gurjun oil, the daily average being two drachms.

The tubercles are less prominent, and they have lost their shiny appearance ; the spots are beginning to fade, and sensation has slightly returned to some of the anæsthetic parts ; these "*sweat*" now, which they did not do before. Does not experience the feeling of cold so much as he used to.

December 10, 1877.—Improvement still continues, the patient having the greatest faith in his medicine. Dose increased to six drachms of the emulsion daily. Tubercles are nearly gone ; all the ulcers except one are healed ; his fingers are becoming supple, and he is now able to do some work about the place. The improvement in the anæsthetic parts still continues ; he can feel the water with his legs and feet when he is bathing ; he eats and sleeps better, and his digestion is improved. He is more cheerful, and says his life was a burden to him

until he began the medicine. Patient subsequently left the asylum, greatly benefited by the treatment.

CASE LIII.—*Non-tuberculated Lepra, improved by Gurjun Oil.*

Wm. Jos. F——, aged 32 years, native of Dominica, W. I. Islands. Was a soldier in the 4th W. I. Regt., stationed at Jamaica, Barbadoes, West Coast of Africa, and arrived at Georgetown four years ago. Was never vaccinated; had small-pox and syphilis. He has mixed intimately with lepers, but attributes the disease to eating something in Africa when he had venereal. He had at first all sorts of pains in his feet; he noticed that on taking off his boots after a march, his feet, which used to perspire freely, gradually ceased to do so, and a sore formed underneath his left foot. An eruption of spots then appeared.

Present state, March 1, 1877.—Eight years diseased. Well developed black man, 5 ft. 9 in. high. There are light-coloured patches on left thigh, front of left shoulder-joint, and on the back; enlarged glands in the groins. There is a conical ulcer under the right great toe, and a small one under the left heel. The right foot and leg are anæsthetic from the toes to four inches below the knee-joint. Ordered same diet and treatment as in the last case.

July 14, 1877.—The treatment has been carried out very irregularly in this case, the patient not taking the oil every second or third day—often omitting three days out of the seven.

He complains that it gripes and purges him, and makes his joints painful. He thinks salted food disagrees with him, and this is a very general complaint with those under this treatment. There is no change in the spots, but the ulcers are quite healed up, and he begins to feel the water when he pours it on his body, and when walking in the water he can feel different substances with his feet.

Ordered fresh meat and fish instead of salted.

October 13, 1877.—He has been taking two drachms daily of the oil, and continues the frictions. The improvement continues, and he is now employed cutting firewood for the asylum.

January 17, 1878.—The spots are nearly all gone, and the anæsthesia of the patches has entirely disappeared. Ulcers are all healed up, and have remained so for the last six months. Sensation in the foot is fully restored. Body now perspires, and his general health greatly improved.*

Case LIV.—The case of Orion M., detailed at page 129, was submitted to the Gurjun oil treatment on April 1, 1877, and the following note made on July 16, 1877 :—

He has been using the oil only at night, and omits taking it internally two or three days in every second week. At first he felt stronger, but the oil purged him too freely. The enlarged glands in the groins, however, have quite disappeared, and there is a slight improvement in the anæsthetic parts.

October 14, 1877.—He has been taking four drachms of pure oil in emulsion daily, and nightly rubbings. The improvement continues; he has been ordered more food. He sleeps better, and is more cheerful.

January 17, 1878.—His face is more natural; the dry scaly condition of face and ears, and puffiness under the eyes, are gone; the eruption has entirely disappeared; the psoriasis is cured; there is now no anæsthesia anywhere, except over a small portion of the ulnar nerve. His fingers have regained their suppleness, and he is distressed that the oil was not in use before he lost the phalanges. The medicine has cured a palpitation that troubled him for years. He is now employed as a fisherman.†

* The improvement in this case lasted for nearly twelve months, when the disease returned. It is, however, kept in check by the use of Gurjun oil, and this man, who formerly was bed-ridden and helpless, now earns a gratuity for work performed at the Asylum. There is no doubt but that several years of life, and which may be utilized, have been gained by the use of this remedy.

† This man subsequently left the Asylum able to earn his livelihood.

CASE LV.—*Case of Mixed Tuberculated Lepra. Disappearance of all the symptoms after five months' treatment by Gurjun Oil, the patient returning home to his friends.*

Heeraloll, a coolie from Calcutta, aged 36 years; fourteen years in British Guiana; now four years diseased; has frequently mixed with leper men and women.

Present state, May 17, 1877.—There are leprous tubercles on the forehead, cheek, ears, and chin; ulcers on the thumb, middle and little fingers of the right hand, which are also œdematous; ulcers on the thumb and index finger of the other hand. There is anæsthesia of the ulcerated parts, which extends to the middle of both forearms. All the fingers are contracted. There are non-tuberculated patches on the abdomen, the back, and on the neck.

There are characteristic excavated ulcers under both feet, from whence anæsthesia extends to the knee-joints.

Ordered Gurjun oil in the usual way on May 24, 1877.

June 7, 1877.—Taking the oil most regularly; one of our most willing patients. To have more rice.

July 21, 1877.—Ulcers healing kindly; tubercles softening; sensation returning in the anæsthetic parts.

October 5, 1877.—All the leprous symptoms have disappeared, except a slight abrasion on the hand, which is ordered to be dressed with lint and Gurjun oil.

October 20, 1877.—Examined carefully this day, the patient having been blindfolded. There is not a single symptom of leprosy present; the tubercles are gone, the spots have disappeared, the ulcers are all healed, and the fingers straight. Although blindfolded, he can tell immediately the instrument touches any part of the body, and he was carefully tested on the lately benumbed patches. He was at this date sent up to the Honourable the Government Secretary, and examined by a Medical Board, and subsequently resumed his usual occupations.*

* Dr. Anderson, Acting Med. Off. to the Immigration Department, reported on this case for the Government to the effect that all leprous symptoms had disappeared, but that a slight degree of anæsthesia persisted in a part which he did not specify.

The foregoing cases were included in the first batch in which this remedy was used, and in the concluding part of my Report for that year (1877) I find the following sentence :—

Among the thirty-two patients then, submitted to this treatment during the past nine months, a very great improvement took place in sixteen of the cases; eight had their symptoms ameliorated, and one case so far recovered (Case LV.) that he was sent home. In one case the patient refused the medicine; three cases had to go into hospital and discontinue the treatment, of whom one died; one became insane, and there were only two cases in which the oil had no appreciable effect on the disease.

In the month of January, 1880, I sent in my Report for 1879, on the continued use of this remedy at the General Leper Asylum, which I cannot do better than reproduce.

The disease had returned with greater severity in many of the cases on which I had first reported, but the experience gained from past cases enabled me to select more suitable ones, and the results have been to confirm my opinion of the beneficial effects of Gurjun oil in the treatment of all forms of leprosy.

Extract from the Appendix to the Annual Report on the General Leper Asylum, Mahaica, for 1879.

A further trial of Gurjun oil in the treatment of leprosy has confirmed the impressions recorded in my Report for 1877. The supply falling short, its administration had to be discontinued, and it was not until last August that I was in a position to resume my investigations with regard to it. Even in cases far advanced I find it is most beneficial, retarding the disease in a remarkable manner, and improving the general health. I am of opinion it should be in general use in every leper asylum; it is sought after by the patients notwithstanding its unpleasantness, on account of its healing action on the leprous ulcerations, and its appetite-giving properties.

The following are the cases in which this remedy has been further employed; the majority are inmates of the leper asylum, but a few private cases, which were not subjected to the improved sanitary condition of the Institution, are introduced to show that the improvement recorded was due solely to the remedy employed. For purposes of comparison I have had some cases treated by other reputed remedies. I may mention that the patients were nearly all suffering from an hereditary form of the disease, cases which I find are most difficult to make an impression on. If it were possible for cases of leprosy to be brought under treatment in an early stage—on the first appearance of the leper spot, before the deposit of leprous matter had taken place to any very great extent, or structures (especially the nerves) implicated seriously—I believe it would be possible, if not

to cut short the attack entirely, at least to retard its progress for many years. The severity of the disease is in direct ratio to the amount of blastema present. Gurjun oil appears to promote absorption of this to a very great extent, and should be employed in the case of non-tuberculated lepra, before the advent of any structural changes in the nerves, or in tuberculated lepra, when the erythematous patch first makes its appearance.

CASE LVI.—*Anæsthetic Leprosy. Hereditary. Great Improvement.*

Joseph P.——, aged 7 years, black boy, not vaccinated, diseased two years. Has leper spots on the left side, cheek, temple, left arm and forearm ; same on the right side, but smaller; leper spots on both legs and thighs, front and back; spots on abdomen, front chest, and back, but hands and feet free; no malformations, a few ordinary sores. These spots are decidedly anæsthetic; they are symmetrical, but *not raised*, of a dirty yellow, and of all shapes. The parts appear as if the skin was stained; in some places the dark black skin fades into the dirty yellowish white. He is covered with scabies. He is too young to give any account of the earlier symptoms. Ordered on August 27, 1879, equal parts of Gurjun oil and lime water, of which he was to take a teaspoonful twice a day. Ordinary diet, and sulphur bath.

September 3.—Dose increased to two teaspoonfuls twice daily, and sulphur ointment applied to the skin.

September 8.—Takes the emulsion well.

September 15.—Spots fading; in good health; appetite better; three teaspoonfuls morning and evening. Bowels moved once in twenty-four hours, secretion of urea increased.

September 22.—Much better. Scabies cured. Troubled with eructations. Dose reduced to two teaspoonfuls twice daily.

October 13.—Circumcision performed. Spots fading rapidly.

October 20.—Wound healed well. Spots are shading into the natural skin. *Pigmentation returning.* Anæsthesia less. Dose has been gradually increased to ½oz. twice daily, and frictions with liniment of Gurjun oil.

November 10.—Natural pigmentation has returned to the spots on the cheeks, which are more like the natural skin now; six drachms morning and evening.

November 24.—Natural colour of the skin returning. Anæsthesia gone. Sweat glands acting. A very great improvement.

December 8.—The heavy rainy season has set in for some days, and the spots seem to brighten up again—they are much brighter to-day. The oil does not purge, and he has been sent to the Infirmary from the boys' working gang, and ordered 1 oz. emulsion morning and evening; also externally.

December 22.—Improving. Continue treatment.

Present state, January 9, 1880.—No scabies; no anæsthesia anywhere. The spots have nearly all faded into the natural dark hue of the skin. A lighter colour now remains where the bright yellow spots were, but where they shade into the healthy skin can hardly be made out. He is in excellent health, but some deposit must still remain, and he will continue the medicine. The quantity he can take without producing either vomiting, purging, or indigestion, is unusual.

CASE LVII.—*Advanced Case of Tubercular Leprosy in a Barbadian Boy. Hereditary. Slight improvement.*

G. R. L——, aged 11 years; diseased for five years; parents dead; not vaccinated.

Head and Face.—He is a black boy. There are well-developed tubercles on ears, cheeks, chin, alæ, nose, upper lip, Schneiderian membrane. *His eyelashes and eyebrows are thick with hair,* as also his head. There is a discoloured state of the skin at the back of the neck. Characteristic nasal breathing.

Front Chest and Abdomen.—There is the peculiar appearance of the skin seen in advanced cases of T. L., unlike the eruption which precedes this form, or that which succeeds the nerve affection in the anæsthetic variety. *It is a mottling,* perfectly symmetrical in dark and light shades of circular markings—not anæsthetic—and the dark being natural skin colour. On the back the light shading predominates, until down the back it presents markings like the branch of a tree. No tubercles in either of these situations.

Right Arm, Forearm, and Hand.—Nails natural, four fingers tumefied on anterior aspect. Tubercles on little and ring fingers. Dark shining tubercles on forearm, psoriatic-like patch on elbow. Discoloured state of the skin in some places. The right extremity almost similarly affected. There is hypertrophy of both lower extremities where the integument is roughened, dark and scabby. Tubercles on upper part of feet; toes tumefied; nails perfect; soles of feet sound. He is anæsthetic over the most developed tubercles. Pair of symmetrical tumours in groins (diseased femoral gland); tubercles on front of knee-joints, and others in various stages of development around the thighs; one standing prominent on right nates. He has scabies on both legs. The tubercles are shining, tense, and fresh-looking in some places—the recent ones forming in concentric rings. The poor lad has the peculiar expression the tubercles give, relieved, however, in this case, by a pair of bright black eyes. The case is typical of advanced hereditary tubercular leprosy. Ordered a special diet with fair quantity of fresh meat, milk and vegetables, and the Gurjun-oil emulsion in two-ounce doses twice daily, and frictions with a liniment, one to three of the same. Commenced treatment, Sept. 3, 1879.

September 8.—Oil vomiting and purging; still takes it.

September 13.—Skin looking more natural. Three ounces twice daily, and frictions.

September 22.—Face looking much more natural, and tubercles less prominent; suffers from indigestion; can hardly take the oil.

October 6.—Has persevered; improving; is learning to be a shoemaker, but ordered to have three hours a day out-door play.

October 20.—Dose increased to half-an-ounce twice daily.

November 10.—Much better; tubercles are softening and disappearing (subsiding), with loose skin over them.

November 24.—He seemed fast improving, when a fresh development of tubercles took place with the usual febrile exacerbation, and he had to be sent to the Infirmary, and ordered baths, diaphoretics, &c.

December 8.—Heavy rains, and patient's condition stationary.

December 22.—Under treatment the improvement has recommenced.

January 9, 1880.—Although greatly retarded by the wet weather, many of the tubercles have disappeared. The peculiar appearance of the skin on the back is no longer there; his breathing is more natural. Skin has lost its scabby appearance, and the boy has been improved in his general health.

CASE III.—*Case of Anæsthetic Leprosy in a Black Boy. Five years' duration. Hereditary. Disappearance of all the symptoms under Gurjun Oil.*

James Brathwaite, black, aged 13 years. Admitted with non-tuberculated lepra, in March, 1876. His sister died with T. L. In 1877 he was placed under Gurjun oil for some months, but unfortunately the notes of his case were mislaid. Treatment was discontinued owing to the supply falling short, and it was only on September 10, 1879, that it was resumed.

State on latter date.—A leper spot involving left eyebrows, lids, and part of temple; the skin is very dark, and the yellowish spot shows out clearly with its edges, on the temple, raised. Anæsthesia well marked. He has a spot on back of right hand, serpiginous, involving the middle finger for three-fourths of its circumference, and encroaching on anterior part of the wrist—all anæsthetic. Several leper sores. Another spot seems to follow the course of the musculo-spiral nerve on the left side. Another spot follows the course of the external cutaneous nerve of the right thigh. Enlarged glands in the groins. Stiffness of fingers. Ordered half an ounce of the emulsion of Gurjun oil and lime water morning and evening, with the usual external application. Fresh meat diet.

September 22.—Spots much less bright. Continue treatment.

September 29.—Doing well. Learning the trade of tinsmith. Looks remarkably well in general health.

October 6.—Nearly well. Continue treatment.

October 13.—Slight discoloration persists. To increase to six ounces twice daily; strong carbolic acid applied to the spots.

October 20.—Carbolic acid reapplied so as to produce vesication.

November 20.—Reapplied carbolic acid.

January 9, 1880.—Spots have all disappeared, enlarged glands in groins gone. Blindfolded, he feels the slightest prick anywhere; nothing remains to show he has had leprosy, except the scars produced in two places by the strong carbolic acid, and I requested his discharge from the Asylum after examination by the Surgeon General.

Several other asylum cases have been treated in the same manner as the foregoing, but they are advanced cases, and have not been a sufficiently long time under treatment to fairly test this remedy.

The following are three cases in my private practice treated in the same way. no restrictions being placed on their dietary, or changes made in their sanitary surroundings:—

CASE LVIII.—*Tubercular Leprosy following syphilis in a Female. Disappearance of all the symptoms under Gurjun Oil.*

Johanna R., Portuguese woman, aged 42. Came from Madeira when a child. Husband died suddenly. Has one child alive, healthy as yet. She was

treated by me in 1877 for syphilis, and since then has lived with or near a person who has been under my care for leprosy. Examined at my surgery, June 3, 1879. The fingers are swollen, red, tense and shining, and clubbed. On right side there is dark purplish shiny infiltration from the back of the hand to upper third of arm, abruptly terminated by healthy skin. On this forearm, with the exception of a small place near the elbow, the infiltration has spread over. On the left side there is a similar state of things, but in a less degree. This eruption has been coming on for some time; it began with a premonitory fever, which ushered in erythematous patches here and on the cheek. There is hyperæsthesia at present. She has a characteristic shiny puffiness of the left cheek, slightly red in colour, commencing tubercular deposition. She has running sores, surrounded with dark-looking old cicatrices, great despondency, &c. A well-marked case of tubercular leprosy in its early stages. She was ordered frequent bathing, &c., and the emulsion of Gurjun oil in teaspoonful doses to commence with, and to be well rubbed into the body before bathing.

June 16, 1879.—Has taken the medicine regularly; it caused gastrodynia and purging, but improved the appetite; patient says she feels "good." Continue.

June 27.—The swelling in the fingers has considerably subsided, and there is a good deal of desquamation of the cuticle at the sides and ball of the thumb, where healthy skin begins to appear. Getting better.

July 8.—Has increased the dose to half an ounce, morning and evening. The tubercular infiltration has subsided, and the diseased parts begin to shade off into healthy skin, and are nearly level with it. Minute little vesicles seem to be studded over the surface of the eruption, softened at the top, but base not inflamed.

When subsequently seen after two months' treatment, all this infiltration had subsided. Her ulcers healed. Puffiness under the eyes gone; a staining on the arm only remained. She seems perfectly well.

Note.—Up to January 10, 1880, the disease had not returned.

Case V.—Was a case of tubercular leprosy in a Portuguese girl, aged 18 years. Under Gurjun oil G. L. improved rapidly, the tubercles disappearing, but finding the remedy unpleasant to take, she ceased attending my surgery. This girl lived in the same yard with the next case, but no family connection.

Case VI.—Antonio de ——, aged 48; diseased before G. L., who lives in the same yard with him. This case also improved under the Gurjun oil, but he has left the district, and my notes are incomplete.

Case VII.—Alex. Mc——, Georgetown, aged 18; under treatment for anæsthetic leprosy. All the spots have disappeared, but he is still taking the oil, as anæsthesia persists over the right ulnar nerve.

Two Europeans with leprosy have been greatly benefited in all their symptoms by the administration of Gurjun oil.

Cases of leprosy were also treated at the General Leper Asylum by Chaulmoogra oil, galvanism, alteratives, iodide of potassium, arsenic with iron, meat diet, milk diet and quinine. The details of these cases would occupy too much space, and it must

suffice to say, that whilst considerable improvement followed the use of Chaulmoogra oil, leading me to expect good results from it, all the cases have relapsed; one of the cases, Wm. A. L., at last examination was found suffering from fresh eruption of tubercles. I shall, however, give this remedy a fairer trial. Beyond some amendment in their general health, no change for the better followed the use of the other remedies employed. After three years' experience, therefore, I can still say, in the concluding words of my Report on this subject in 1877 :—"In Gurjun oil we appear to have a most valuable medicine for the treatment of leprosy in all its forms; one capable of retarding the ravages of the disease, in some cases apparently curing it."

(Signed) JOHN D. HILLIS, F.R.C.S.

General Leper Asylum, Mahaica,
January 10, 1880.

CHAPTER VI.

The Leper Asylums of British Guiana.

At a place called Kaow Island, Rio Mazaruni, near Her Majesty's Penal Settlement, a few cases of leprosy are located, and here it was that the Beauperthuy treatment was carried out. This establishment must be found useful by the Government or the expense of keeping up separate asylums would not be continued. Dr. A. G. M. Cameron, when Special Commissioner for visiting the asylums, was called on to give an opinion "as to the advisability or otherwise of retaining the asylum on this island any longer, either as an experimental and convalescent leper asylum, as at present, and whether it would be advisable to transfer these lepers to Mahaica or to send the male lepers from Mahaica to Kaow Island, having only one establishment for the reception of these unfortunate beings."—*Letter to the Colonial Secretary*, May 24, 1874.

My own opinion is that Kaow Island is unsuitable for a leper asylum, and I find from the above letter that Dr. Cameron, although he states it has isolation to recommend it, yet, "on the other hand, the island itself, with the exception of a circumscribed rocky headland at one extremity, is some feet below the tidal level, and is badly drained, and even such drainage as exists is maintained with difficulty. It is infested to a very great extent by large red biting ants, which molest the patients very greatly, and which I am told was a main reason for abandoning Kaow Island many years ago as a leper asylum. The plague of mosquitoes, too, is very distressing to the patients at all seasons. I believe these insects are more abundant here than in any other part of the country. Large bats abound at Kaow Island also, and are a source of annoyance to the residents during the night."

Dr. Cameron thus concludes his letter :—

After carefully analyzing the advantages of both asylums, I would respectfully submit that, in my opinion, no commensurate advantage is gained by maintaining a separate leper asylum at Kaow Island, and that it would be better for those now there to be removed to Mahaica as soon as room can be made for their reception."

From a long acquaintance with the place I can endorse every word Dr. Cameron has written. My last visit there was on February 2, 1879, in company with the Chaplain of the Settlement, who officiates there also. During the preceding year (1878) there had been a total of fifty-eight inmates, of whom seven had died; the majority were cases of nerve-lepra, composed of the usual races. The lepers live in detached thatched cottages, each bed having a curtain to protect the inmate from vermin. The dispenser in charge lives on the headland already mentioned. All the bedridden ones get cooked rations, the others raw rations, which they cook themselves; all take coffee and milk from the kitchen. None of the lepers are engaged in systematic industrial occupation. Divine Service is held every Sunday, and the chaplain visits on Tuesdays and Fridays. The medical officer, who is also surgeon to the Settlement, visits three times a week, and oftener when necessary. The institution is supervised by the Inspector of Prisons, to whom the medical officer furnishes an annual report, the responsible superintendent being the superintendent for the time being of the convict settlement.

From the reports of these officials for the year 1879, I have obtained the following information :—

The medical officer, Dr. Kennedy, remarks in a short interesting report to Captain Fortescue, the superintendent :—

The general sanitary condition of the asylum, though much improved by better drainage, is still open to further improvements. The houses are constructed with wattled walls, daubed with mud and mortar. The walls become cracked in dry weather, and when the rainy season sets in large pieces often fall down, leaving apertures which freely admit wind and rain. Within the last month the superintendent has replaced some of the worst parts with boards; and if all the walls were boarded in a similar manner, the houses would be more comfortable and healthy. . . . . A small hospital, which would accommodate at most six patients, is very much required. Acute diseases cannot be fairly treated in the houses as they now are . . . . cells to confine the refractory inmates, and thus avoid the necessity

of sending them to the penal settlement might be constructed. It is unfortunate that serious cases of lung disease and diarrhœa must be treated in houses often not weather proof.

The suggestions of Dr. Kennedy I believe have been carried out, but before much money is spent on the place, a revival and decision of the question as to the advisibility of retaining the place as a separate asylum for lepers would be of advantage to the Colony.

Captain Fortescue reported that much trouble had been caused "by the persistent way in which the lepers give tobacco and opium to the working parties of convicts employed on the island, the constant high tides, and from the flimsy construction of the huts in which the patients live."

The following was the expenditure of the establishment for the year, and the strength :—

Expenditure.

Staff.	£	s.	d.	Cost of Establishment.	£	s.	d.
Medical Officer . .	187	10	0	Provisions	579	5	8
Chaplain . . .	175	0	0	Meat	292	0	11½
Dispenser . . .	92	10	0	Milk	121	19	4½
Head Nurse . .	63	1	1	Clothing, Tools, &c.	104	3	4
Second Nurse . .	45	0	0				
Cook	45	0	0				
Labourer	35	12	5				
Cattle Minders . .	1	17	6				
Total . .	£645	11	0	Total . .	£1097	9	4

The total cost of the establishment, including officers' salaries, £1,743 0*s.* 4*d.*

Strength of the Asylum.

Total strength from 1st of January, 1878	48	
Received during the year	31	
	—	79
Died during the year	6	
Transferred to Lunatic Asylum	2	
Proceeded to India	13	
	—	21
Remaining, on January 1, 1880		58

The General Leper Asylum.

This establishment, at one time a military barrack, is situated at the mouth of the Mahaica river, and is washed by the waves of the Atlantic Ocean. It has been used for the reception of cases of leprosy since 1858, the staff consisting of a resident lay superintendent, an apothecary, and a few servants. The surgeon of the neighbouring district was engaged to attend to any case of illness occurring among the inmates, and a special Commissioner for visiting Leper Asylums was latterly appointed whose duties were to visit once a month and make a report to the Executive.* Such was the state of affairs in March, 1877, when I assumed charge. There were then 199 males and 68 females, who were housed in the buildings formerly occupied by the troops :—

No. 1,	consisting	of	two	wards,	each	78 feet ×	26 feet.
No. 2	,,		,,	,,		70 ,,	20 ,,
No. 3	,,		,,	,,		70 ,,	20 ,,

From constant change of medical officer, and the difficulty of obtaining the services of a suitable person as superintendent with the necessary administrative capabilities, the asylum, from want of supervision, had gradually been getting into a discreditable condition, the lepers being allowed to do just as they pleased, and get anything they clamoured for. With a view of remedying existing irregularities, which greatly concerned the Government, I was invested with sole authority, and a manager or steward, with other servants were appointed to carry out my instructions. To quote from my official report, "the place was greatly overcrowded, the records were imperfectly kept, raw rations were issued to the lepers, and everyone cooked his or her food in various parts of the houses, and yards. Wines, spirits, and tobacco were issued in unsuitable quantities, indiscriminately, and in unsuitable cases; and the general sanitary condition of the place was neglected, the mortality being as high as 16·33 per cent." In para. 4 I stated, "At an

* This office was abolished in 1880.

interview with His Excellency the administrator, W. A. G. Young, Esq., C.M.G., I learnt how anxious the Executive were to remedy this state of things, and to the full support then given me by the latter may be attributed, in great measure, any improvement in the health and comfort of the lepers that has since taken place."

Our present Governor, His Excellency C. H. Kortright, Esq., C.M.G., soon afterwards arrived, and lost no time in visiting the asylum, directing or sanctioning certain improvements tending to the welfare of the inmates; nor did he allow his interest in the matter to cease until he had seen this institution placed in what he was pleased to term "a highly satisfactory condition."

My Report for the year 1879 contains a narrative of the manner in which the asylum is at present conducted, and from it I take the following, which may not be uninteresting, particularly to my readers in other West Indian Colonies:—

Extracts from the Superintendent's Report for the year 1879.

I purpose in this Report placing on record a detailed account of how the Leper Asylum is at present conducted. I early foresaw the necessity of making a division of the lepers into:—1. Those able to do a little work; who should be made to perform some industrial occupation for the benefit of the Asylum, suitable to their state and condition, this being necessary for health as well as discipline. 2. The sick and bed-ridden, those taken ill with the various illnesses incidental to their condition, where they could be subjected to skilled advice, and receive greater care and nursing.

Those belonging to the former class may be located in general wards as at Mahaica, or in huts with plots of land attached; the latter require to be placed in properly appointed infirmaries with a staff to attend them. This is the system I have endeavoured to carry out.

The Infirmary.

On the removal of the females I was able to select their lower ward for the purpose of an infirmary, and here all bed-ridden cases were removed, and fresh cases of sickness occurring received and attended to. This room measures 25 feet by 70 feet by 12 feet, and contains twenty beds (20) giving a cubic capacity to each of over (1,000) one thousand: the ventilation is sufficient, and under control by means of sash windows, jalousies, &c. There is the disadvantage

of inmates being located in the ward overhead, but I have modified this as much as possible by only placing there the nurses and attendants (all lepers), and a few most orderly inmates. The advantages are—

(1.) Convenient series of latrines.
(2.) A verandah in front open to the sea breeze.
(3.) Separation from the noise and bustle of the general wards.
(4.) Proper height from the ground.
(5.) Large open space in front.

Should the suggestions I have brought forward further on meet with approval, the Government will have placed the sick lepers under as good conditions as necessary.

The Infirmary is visited by the medical officer every forty-eight hours at least. He is met there by the dispenser and apothecary who is responsible for the care of the patients, and a case-book is provided wherein are entered up all the particulars of the case under treatment, stimulants and extras ordered, &c. The treatment is afterwards written up on a black board at the head of the patient's bed. In the case-book also appear particulars of cases of leprosy under treatment by specific remedies, a record of which is given in an appendix. Trifling ailments that occur daily are treated at the dispensary every morning; any serious case is at once admitted. The following were the cases admitted into the infirmary during the year from the wards:—

General debility (exhaustion from leprous ulcerations, &c.)	21
Diseases of the eye	4
Phagedænic ulcerations	37
Muco-enteritis	6
Bright's disease	18
Pneumonia	3
Diarrhœa	8
Tubercles obstructing breathing	4
Remittent fever	6
Phthisis	4
Fracture (accident)	1
Hæmoptysis	1
Bronchitis	4
Anæmia	6
Development of tubercles (febrile exacerbation)	4
Dysentery	4
Constipation	2
Gangrene	3
Dementia	1
Internal piles	1
Abscess	1

The following is the table of deaths for the year, the letters A. L., T. L., and M. L. meaning respectively anæsthetic, tubercular, and mixed leprosy:—

No.	Country.	Sex.	Age.	Form of Leprosy.	Duration in Years.	Date Death 1879.	Cause of Death.
1	British Guiana	M.	47	A. L.	18	January	Leprosy and Exhaustion
2	Barbados	,,	49	,,	5	,,	,, Gangrene
3	British Guiana	,,	60	,,	3	February	,, Dropsy*
4	,,	F.	25	,,	17	,,	,, ,,
5	,,	M.	24	,,	14	March	,, Diarrhœa
6	,,	,,	69	,,	20	,,	,, Dropsy
7	,,	,,	26	T. L.	2	,,	,, Phthisis
8	,,	,,	14	,,	6	May	,, Anæmia†
9	Africa	,,	32	,,	4	,,	,, Exhaustion
10	,,	,,	50	M.L.	12	June	,, Capillary Bronchitis
11	Madeira	,,	42	T. L.	11	,,	,, Exhaustion
12	China	,,	40	A. L.	1	,,	,, Gangrene
13	Barbados	,,	29	T. L.	6	,,	,, Exhaustion
14	China	,,	40	A. L.	1	July	,, Gangrene
15	British Guiana	,,	18	T. L.	16	,,	,, Exhaustion
16	Barbados	,,	48	A. L.	1	August	,, ,,
17	,,	,,	17	T. L.	5	,,	,, Phthisis
18	East Indies	,,	75	,,	13	,,	,, ,,
19	British Guiana	,,	54	,,	10	,,	,, Dropsy
20	,,	,,	50	A. L.	14	September	,, Enteritis
21	Africa	,,	64	T. L.	15	October	,, Dropsy
22	China	,,	39	,,	9	,,	,, Enteritis
23	British Guiana	,,	25	,,	9	,,	,, Exhaustion
24	,,	,,	18	,,	6	,,	,, ,,
25	,,	,,	27	A. L.	11	November	,, Phthisis
26	,,	,,	13	,,	4	December	,, Dropsy
27	Madeira	,,	62	,,	12	,,	,, Exhaustion
28	China	,,	48	T. L.	9	,,	,, Exhaustion and obstruction of windpipe from tubercles

The mortality to strength therefore for the year was 11·29 per cent.

The average duration of tubercular leprosy in British Guiana amongst males I have found to be nine years; a reference to the death list will show that many of these cases had exceeded this term. Nos. 2, 3, 7, 11, 15, 16, 20, 23, 27 arrived from the Alms' House, Georgetown, in a very debilitated condition; they were carried from the cart which brought them from the railway station direct to the Infirmary, where in a short time they died. Otherwise the mortality this year would be less than on any previous year. Among the 206 old patients remaining on the 1st of January, 1879, there were 18 deaths, or a mortality of eight per cent.; whereas among the admissions (42) during the year there were ten deaths, or a mortality of 25 per cent.

The following table shows the mortality to strength for the past three years:—

Year.	Total Strength.	No. of Deaths.	Percentages.
1877	261	30	11·49
1878	261	24	9·19
1879	245	28	11·29

This, without decimals, gives an average during these years of ten per cent. Considering the nature of the disease, and, that only the worst and most destitute

* Bright's disease.

† P. M.: Fibrinous clot, right side of heart.—Died suddenly.

cases are sent to the Asylum, I am of opinion that we cannot expect to reduce this mortality much lower.

In the next table I have given similar statistics for the three preceding years for purposes of comparison :—

Year.	Total Strength.	No. of Deaths.	Percentages.
1874	243	37	15·22
1875	288	50	17·36
1876	300	49	16·33

Without decimals an average of 16 per cent. of deaths to strength, as against 10 per cent. for the following period.

On assuming charge I found five blind lepers; these I have placed by themselves, with an inmate told off to attend on and read to them; he receives a few shillings a month as a gratuity, and these miserable sufferers are made as comfortable as possible.

Attached to the infirmary are four nurses and dressers, inmates, who either were nurses before they were diseased, or who have been trained to the work ; their duties are to look after the sick in hospital under the dispenser and apothecary, and very good nurses they make ; they have no objection to what is certainly a most arduous and loathsome employment, dressing the extensive phagedænic ulcerations so common among lepers.

Until the erection of the mortuary which the Colonial civil engineer has received instructions to erect, I have had screens made, to be placed around the bed of a patient who may be very ill or who dies. The erection of this building should not be delayed, for I am greatly hampered in my study of the disease by not having a proper place to make *post mortems* in, and a corpse should not be allowed to remain in the Infirmary one moment longer than is necessary for its removal.

The importance of baths and diet in the treatment of leprosy has not been lost sight of.

Baths.

The Asylum is situated at the side of a large river, and there ought to be no difficulty in the matter of frequent bathing, so necessary for lepers. The new baths lately erected are too small, and, through some defect in the supply pipe, the supply is not as constant or sufficient as I could wish : they are sufficient for general use, but other baths are also necessary, viz :—

1. A sulphur bath. Seventy-five per cent. of all lepers admitted are afflicted with the *Acarus scabiei* (Itch), which a sulphur bath speedily cures. I have improvised one, but it is not suitable.

2. Hot air or vapour or water baths. These are necessary for patients with dropsy, febrile exacerbation attending a fresh development of tubercles, &c. I have suggested to the Colonial civil engineer the following points for the consideration of the executive, together with a rough plan to be carried out when erecting the mortuary :—

To erect a small building to the west of the infirmary with an enclosed passsage leading to a room where operations could be properly performed; from this room a staircase would lead to the dead room below, merely a part of the building closed

in with a ground floor. On one side of the operation room would be two others for sulphur and hot air or water, and, on the other side, three or four baths lined with lead, supplied by pump from the artesian well, for general purposes. All these may be of the simplest description.*

Diet.

The dietary of lepers is of paramount importance; it has been considerably modified lately, and the following is what is now in use. Experience has caused me to somewhat modify the opinions I held on the subject of salted food; in moderate quantities and proportions, of good quality, and properly prepared, I think it more advantageous than otherwise. Cooking is now done by steam by Captain Warren's patent process, coal being the fuel used, thus effecting a considerable saving; what is of importance, the food is more quickly prepared, and the inmates get it hot. The small quantity of wood used is collected by the lepers from the asylum grounds :—

The Dietary.

	Bread.	Beef, Pork, or Mutton.	Rice.	Plantains, or other Vegetables.	B. Sugar.	Salt Fish.	Salted Pork.	Barley or Flour.	Split Pease	Coffee.	Ox Head.	Lard.	Arrowroot.	Sago.	Milk.
	oz.	oz.		lbs.	oz.	oz.	oz.		oz.		oz.			oz.	oz.
Sunday	4	...	1 lb.	1½	in coffee	5	...	1 lb. in pudding	in soup	pint	in soup	½ oz. per diem.	...	...	in coffee
Monday ...	4	...	...	3	do.	10	1	...	...	do.	...		...	...	do.
Tuesday ...	4	...	4 oz.	3	do.	6	1	...	do.	do.	...		...	...	do.
Wednesday ...	4	5	...	...	do.	5	...	...	...	do.	...		...	...	do.
Thursday ...	4	...	...	3	do.	5	...	...	...	do.	do.		...	...	do.
Friday	4	...	...	1½	do.	5	1	1 lb. in dumpling.	do.	do.	...		...	...	do.
Saturday ...	4	5	...	3	do.	10	...	...	...	do.	...		...	...	do.
Infirmary ...	8	Beef Tea.	...	...	...	...	...	1	...	...	...	...	†	1	10

Dwellings.

The two large buildings with verandahs are still in use and kept in fair repair. The ventilation is good, but might be improved by a few sash windows, and one or two cowmouths. During the year the buildings have been thoroughly painted with several coats of paint, and whitewashers are kept constantly at work with this purifying and cleansing arrangement. Owing to the removal of the females and some males, the number of inmates has been reduced to what the asylum can properly contain, and should never exceed 150. Each leper has now over 1,000 cubic feet air space, and, with the additions to the ventilation above mentioned, will be fairly well off in this respect.

The new offices for surgeon-superintendent, and dispensary, answer well the purposes for which they are intended.

A recreation shed over 100 feet long has been erected in the grounds; this is a

* Since ordered to be carried out.

† When ordered.

great boon, enabling the inmates after working hours to sling their hammocks, and allow their wards to be purified by bedtime. A portion of this has been railed off for the chaplain, so that all the inmates may assemble at service if they so desire.

Latrines.

Separate sets of latrines are attached to each ward on the dry earth system, with earth prepared by the lepers. These have my constant attention, and their Excellencies the Governor and Lieutenant-Governor have been pleased to record their appreciation of their cleanly condition.

Grounds.

The grounds around the asylum are kept free from grass and weeds, drained and constantly shelled; hard wood V-shaped drains now take the place of the old ones, and are an obvious and valuable improvement on the common open porous drains. They are kept flushed with running water from a spring.

New palings have been erected, railing off each building, with turnstiles to each gate; there is thus perfect freedom of ingress and egress throughout the establishment, whilst the old crowding and confusion is done away with. A large plot of land directly to windward has been reclaimed from the sea at great expense, the trenches dug and parapetted; there is in course of preparation a sea-wall, protected by granite, and washed by the Atlantic, on which the inmates may walk and enjoy the invigorating N.E. trades which blow directly in.

A box for flushing the trenches at high water is much required, and I would respectfully direct attention to this matter. The kitchen sewage still runs into them, and it matters little removing fæcal matter if sewage is allowed to decompose there. I hope the glazed pipes already at the asylum will be utilized, and this defect in the internal drainage of the asylum remedied.

Water Supply.

With the present residents the supply is sufficient and of good quality, except in case of very prolonged droughts. The artesian well supplies abundant for washing and sanitary purposes, and would supply the proposed baths.

Industrial Occupations.

There is nothing more injurious or subversive of discipline than having a number of chronically diseased people, who are able to do a little work, huddled together in listless apathy. The evil habits the lepers had got into were very difficult to overcome and remove; the only inducement I was in a position to offer, a little tobacco or sugar as extras, they had already received, of the latter in hurtful quantities, the curtailment of which they looked upon of itself as a heavy grievance. The Government, however, granted the sum of 29 dols. a month to be given as gratuities, which enabled me to have a good deal of work done, to the benefit of all concerned. The following is an extract from the work book, showing the nature of the work they are engaged in,—the tinsmiths' workshop has only been in operation for four months:—Overseer, 1; minding the boys, 1; carpenters and apprentices, 5; shoemakers and apprentices, 6; tinsmiths and apprentices, 4; hospital nurses and dressers, 7; whitewashers and painters, 4; tailors, 3; pioneers, scavengers, scrubbers, &c., 14; yard sweepers (two in each yard), 6; wardsmen

(responsible for the cleanliness and order in their wards), 5; schoolmaster; water-carriers, 2; washers, 4; transporting, collecting and cutting up firewood, 6; grave-digger; grass weeders, 7; boy to mind donkey; lamp-lighter; pulverizing earth for latrines, 14; meal servers and general jobbers (all boys), 7; 1 man tending the blind; 1 to clean cooking apparatus; total, 92, out of 122. On an average about 75 per cent. of the inmates engage in some industrial occupation.

I have encouraged as much as possible trades; the work is liked, and it is useful. Two carpenters generally have 3 apprentices learning, who are in their turn promoted. They have done the following work during the year, besides constantly effecting general repairs, &c.;—built and erected two sentry boxes, a kitchen for officers, fence round Superintendent's house, one dozen trays, four benches, &c.

Shoemakers.—All the slippers and boots used by the inmates are made by the inmates. Apprentices are kept learning the trade. During the year they furnished the following work, viz. :—

240 pairs of slippers, value	$86 00
72 do. of leather boots	172 80

It is astonishing, with their mutilated hands, how they managed to do it.

Tinsmith.—Besides teaching apprentices, making repairs, &c., during four months this man has delivered 365 tin cups, pans, etnas, pots, &c., which I have had valued at $39 88. The apprentices are able to work at the trade themselves now. I would ask for a small monthly gratuity for this man, to place him on an equal footing with the other tradesmen. Sometimes I like to increase a gratuity by a shilling or so, or stop a similar amount; but at present I have to draw a fixed sum—say $29. Besides the tinsmith, I would like to give the men who rough wash the clothes something; if his Excellency would sanction $35 a month to be drawn I could send in monthly a detailed statement of what I require within this amount.

School.

A school is established at which the boys, and whoever wishes, are taught to read; those apprenticed to a trade must attend school from 12 to 2 daily, the others a longer time. The average attendance during the year was 15. The schoolmaster has special charge of the boys.

Amusements.

These are fishing—fish being abundant; the Chinese are adepts at this. Planting around the dams, draughts, cricket, warree—an African game something like draughts,—music. Latterly, the Government permitted me to purchase a harmonium, for which the lepers are most grateful; it will enliven their evenings and their Sunday services.

Daily Routine.

All inmates of the General Wards rise at 5 A.M., make up and clean round their bed, bathe, dress their sores with the various lotions and well-picked oakum (nearly every leper is ulcerated somewhere, except on the face), and is expected to be ready for his coffee at 7 A.M. The following are the regulation hours :—

Meals.

Coffee—7 A.M. Breakfast—11 to 12 noon. Dinner—4 P.M.

Working Hours.

Out-door 8 A.M. to 10 A.M. 3 P.M. to 4 P.M.
In-door, Trades, &c.—8 A.M. to 10 A.M. 12 P.M. to 4 P.M.

School Hours.

12 noon to 3 P.M.
Apprentices—12 ,, 2 P.M.

Every inmate on admission into the asylum is brought before the Medical Officer, examined in his private office, and the particulars of his case carefully entered up in the General Register, which it is hoped will prove a work for reference hereafter. Each admission is numbered, and his name, date, &c., written on a black board and placed at the head of his bed. He is provided with an iron bedstead, mattress, pillow, three sheets, three pillow-cases, and blanket marked with the letters G. L. A. He also gets tea-cup, tin pan and spoon, and clothing, and regulation covered box.

Clothing.

Clothing is issued three times a year, but this is insufficient; it should be every quarter, considering the nature of the materials. Every leper gets a cotton shirt, blue jacket and trousers, flannel shirt, and felt hat. Boots and slippers according to circumstances. The clothing is marked with the same initial letters.

Laundry.

The washing is done by the inmates, one paid servant being employed to finish them off. The sheets, &c., of the general wards are changed three times a week; those of the Infirmary daily. A mangle, if provided, would be of great assistance, and give a neater appearance to the articles washed. I would respectfully recommend the purchase of one for the Institution. A sewing machine would enable me to have clothing made on the premises, and provide pleasant indoor occupation.

Visitors.

His Excellency the Lieut.-Governor paid two surprise visits during the year. Six visits were paid by official visitors, and fifteen other visitors recorded their visits in the Visitors' Book during the year.

The medical officer paid 185 visits during the year. The chaplain held forty Sunday Services, and paid fifty week-day visits; the average attendance at service was fifty.

Officers and Servants.

The following is the paid staff:—Superintendent, dispenser and apothecary, eight warders, gate-keepers, or messengers, &c., two cooks, one laundress. These have conducted themselves to my satisfaction during their term of office. The present manager, Mr. L. Backer, succeeded Mr. T. O. Chubb, who was dismissed for irregularities. Mr. Backer, during the past six months has been most anxious to carry out faithfully all my instructions; his duties, as well as those of the dispenser, are now arduous, and the monotony is very great, to say nothing of the nature of the employment they are engaged in; I gladly recommend their case to the favourable consideration of the Executive.

General Remarks.

With the money sanctioned for this purpose, I purchased and distributed on

Christmas day, thirty prizes in suitable books to the best scholars and best behaved of the inmates.

Roast beef and plum pudding was provided for their dinner on that day.

I had written thus far, when, through the courtesy of the Hon. the Government Secretary, I was favoured with a perusal of the valuable papers by Dr. Gavin Milroy on "Leprosy and Yaws in the West Indies." It may be, perhaps, out of place in a report of this kind, nevertheless, as the papers in question deal with the subject of leprosy in British Guiana, and reference is made to the Asylum under my charge, I may be indulged for briefly alluding to it. Dr. Milroy, it appears, visited the Mahaica Leper Asylum on July 29, 1871. In his letter to Earl Kimberley, page 2, he states :—"The locality is extremely unhealthy. The wooden buildings of the Asylum were formerly military barracks; the health of white troops must have been inevitably quickly ruined by residence in such a spot. *It had happily been condemned for even its present purpose before I left England*," and then he goes on to describe the condition of the place as he found it. The Asylum must certainly have been in a very unsatisfactory state, I was not, however, prepared to read Dr. Milroy's wholesale condemnation of the place. His opinions are entitled to all respect, but I think the record of the past few years shows that such radical measures as total abandonment were not absolutely necessary, and that attention to sanitary rules has done a good deal to make the people healthy, and the site a more suitable one; it should, however, be remembered that at the time of Dr. Milroy's visit, the piece of land to windward had not been reclaimed, nor had he an opportunity of seeing the lepers airing themselves on the present sea wall.

Estimate—1880.

The Estimate which I have the honour to submit is similar in amount and items to that of 1879. All the accounts have not yet come to hand for the past year; it will, however, be found that the expenditure has been within the amount voted.

Dietary	$12,000
Wine and Spirits	200
Bedding and Clothing.	2,500
Fuel, and Lights	600
Medicine and Medical Appliances	750
Burial Fees	100
Miscellaneous	1,000
Tools and Appliances	200
	$17,350 = £3614 11 8

I have the honour to be, Sir,

Your most obedient Servant,

(Signed) JOHN D. HILLIS, F.R.C.S.

The Hon. W. A. G. YOUNG, C.M.G.,
Government Secretary, &c. &c. &c.

RULES AND REGULATIONS

FOR

THE BRITISH GUIANA LEPER ASYLUMS.

His Excellency the Governor has been pleased, in exercise of the power contained in Ordinance No. 18 of the year 1870, to make the following Rules and Regulations for the control and management of the Leper Asylums in British Guiana, other than Kaow Island, for which Asylum special Rules will be made :—

Part I.

Of the Administration of the Asylums.

Part II.

Concerning the Inmates.

Part I.

Of the Administration of the Asylums.

1. The Asylums shall be subject to the inspection of the Surgeon-General, the Medical Officer of the Immigration Department, the Special Commissioner for visiting Leper Asylums, the Chairman of the Poor Law Board, and such other official visitors as may be from time to time appointed by the Governor, who may visit the Asylums at any time, and make such remarks as they may deem proper in a book to be kept at each Asylum, and called the Visitors' Book, copies of which remarks shall be sent to the Government Secretary as soon after as conveniently may be by the Superintendent of each Asylum.

2. The Asylums shall be visited at least once in every month by the Special Commissioner, or some other official visitor appointed for that purpose.

3. The Special Commissioner, or other official visitor, shall, on every such visit, inspect every part of the Asylum and see whether it is in good order and clean. He shall also inspect the Journals to be kept by the Medical Officer and Superintendent, and shall ascertain that the visits of the Medical Officer have been regular, and shall on his return to town report in writing to the Government Secretary any matters that require attention.

4. The Special Commissioner shall, on every such visit, examine into any complaints made by any inmate of the Asylum, and take such action thereon as to him may seem proper.

5. The Special Commissioner shall, on every such visit, hear any application which may be made by any inmate for leave to quit the Asylum, and may, if he thinks proper, authorize the Superintendent to grant leave to any such inmate for a period not exceeding one month, provided that no such leave be granted unless a relative or friend of the Leper shall guarantee to receive and take care of such patient for the whole of the time of his or her absence.

6. The Special Commissioner shall, in the month of January in each year, furnish to the Government Secretary a Report upon the Asylums for the preceding year, with such suggestions as he may deem proper to bring under the consideration of the Government; and he shall in such Report state the number of inmates in each Asylum at the commencement of the previous year, the number of those who were received into and taken from the Asylum during the year, and the number remaining at the close of the year, and shall add thereto the Report of the Medical Officer of the Asylum.

7. The Medical Officer in charge of each Asylum shall visit the Asylum at least once in every forty-eight hours (Sundays excepted), and oftener when necessary.

8. He shall keep a Case Book, in which he shall enter fully the history of every case admitted into the Asylum, and shall order in writing such medicines and diet as he may think proper for any inmate; but he shall not alter the general diet tables referred to in Rule 48.

9. He shall personally perform every surgical operation that may be necessary in any case under his care.

10. He shall endeavour, by careful experiments, to be recorded in the Case Book, to ascertain what method of treatment is best calculated to cure or relieve Leprosy, and shall from time to time, as he thinks proper, recommend such alterations of the dietary as he may think best for the inmates, which recommendation shall be transmitted to the Government Secretary.

11. He shall be careful that cleanliness, good order, and discipline are maintained in the Asylum, and shall have the power of ordering any of the punishments hereinafter specified to be inflicted.

12. He shall keep a Journal of the principal events which occur at the Asylum, and shall enter therein the date of every visit he makes to the Asylum, and any orders he may think it right to give to the Superintendent.

13. The Case Book and Journal of the Medical Officer shall be kept at the Asylum in such form as may be approved by the Governor, and shall be submitted to the Commissioner or other inspecting officer at his visits, and shall be sent to the Special Commissioner when required by him.

14. He shall make a Report to the Special Commissioner within the first fourteen days of each year of the diseases and deaths which have taken place in the Asylum in the preceding twelve months, and shall append thereto a general sanitary record of the Institution.

15. The Superintendent of each Asylum shall reside in the apartments provided at the Asylum for that purpose; and shall not be absent from the Asylum for more

than twelve consecutive hours without permission from the Governor; and shall visit each ward, and every part of the Asylum, at least once a day; and shall see that the directions of the Medical Officer are carried out thoroughly.

16. The Superintendent shall be responsible for the cleanliness and general discipline of the Asylum, and shall have control over the attendants and others employed therein; and may discharge any of them for sufficient cause, subject to the approval of the Governor.

17. The Superintendent may punish any inmate for disobedience of the Rules of the Asylum by such punishments as are prescribed in these Rules.

18. The Superintendent shall keep an Official Journal at the Asylum, in which shall be noted every infraction of the Rules of the Asylum by any of the persons employed therein, or by any of the inmates; and every punishment inflicted upon them, and any other occurrences relating to the good order of the Asylum, or otherwise proper to be noted; and the Journal shall be always open to the inspection of the Medical Officer and Visiting Commissioner, and official visitors appointed under these Rules.

19. The Superintendent shall, on or before the third day of each month, transmit to the Government Secretary a Report of the number of patients admitted, discharged or died during the preceding month.

20. The Superintendent shall keep the following books:—

a. Issue-book, in which an account shall be kept of all stores received and issued.

b. A Register of Inmates, in which is to be recorded the name, age, sex, country, colour, and previous occupation of every inmate admitted into the Asylum; the length of time that he or she has been afflicted with the disease prior to admission, the actual condition of the inmate when admitted, the date of admission, and such other particulars as the Governor or Special Commissioner may from time to time direct.

c. Letter-book, in which are to be copied all Letters or Reports emanating from the Establishment.

d. And such other books as the Governor may from time to time direct.

21. He shall make a Report to the Special Commissioner, within the first fourteen days of January in each year, of the state of the Asylum in the preceding year.

22. He shall, whenever an Inmate dies, if between the hours of 6 A.M. and 6 P.M., immediately notify the Medical Officer of the event. If the inmate should die in the night, a messenger shall be despatched with a report of the death to the Medical Officer before 10 A.M.

23. If any inmate shall quit the Asylum without leave, the Superintendent shall forthwith give notice thereof to the Chief Officer of Police of the District.

24. The Dispenser shall act as Assistant Superintendent and shall assist the Superintendent in maintaining order and cleanliness, and shall reside on the premises, and shall be absent only with the consent of the Superintendent.

25. The Dispenser shall visit the wards as early as possible every morning; inquire into the condition of the bedridden inmates, and see that they are attended to, and report to the Superintendent any irregularity on the part of the attendants.

26. The Dispenser shall, upon the admission of an inmate, fill up a card with the name and date of admission, and place it over his or her bed.

27. The other Attendants shall reside on the premises, and shall at all hours of the day or night attend to the orders of the Superintendent, who will regulate the hours during which they are to remain on duty.

28. The Attendants are to cause the Wards to be cleaned before 7 A.M., having previously attended to the bedridden inmates; and they will take especial care that the clothes and bedding of the inmates are kept as clean and in as good repair as it is possible for them to be kept; and that the meals are served regularly and properly; and they will report any improper conduct to the Superintendent.

29. The Attendant on duty for the day, of the Female Ward, is to count the clothes sent to or received from the wash, and to enter the same in the Washer's Book.

30. All torn articles of clothing, bedding, &c., susceptible of being mended, are to be separated from the whole ones, and are to be mended by the inmates as may be directed by the Superintendent.

31. The Gate Keeper is to attend constantly by day at the front gate, and not to permit the egress of any inmate without the permission of the Superintendent.

32. The Gate Keeper is to perform all such other duties as may be directed by the Superintendent.

33. The Cook shall attend from 5 A.M. to 5 P.M. in the kitchen, which must be kept clean and in good order; and the inmates are not to be allowed to enter the kitchen without permission from the Superintendent.

34. The Washer shall attend daily, from 7 A.M. to 5 P.M., and shall have every article of clothing and bedding belonging to the Institution properly washed.

Part II.

Rules concerning the Inmates.

35. The Inmates of the Asylum are required to conduct themselves in a quiet and orderly manner, and to obey at all times the directions of the Medical Officer and the Superintendent, whether given directly in person or through an attendant.

36. They shall get up, with the exception of the sick or bedridden, at 6 A.M., and arrange their beds, remove their chamber utensils, wash and clean themselves before seven o'clock.

37. They shall retire to bed at 8 P.M., when all lights shall be extinguished, except a light suspended from the ceiling, which shall be kept burning throughout the night in each of the wards.

38. The inmates must use with care, and not injure, the body and bed-clothing which is provided for them. Inmates may wear any articles of clothing supplied to them by their friends.

39. Their cup, plate, knife and fork, and any medicine which has been ordered, shall be kept on the shelf above the bed, and nothing else shall be put thereon. Any private effects, not liable to decomposition, may be kept by each inmate in a box.

40. All the inmates, without exception, are required to engage in such work or employment, in or for the benefit of the Asylum, in such capacity, and for such length of time, as the Superintendent, with the approval of the Medical Officer, may

direct. A Work Book shall be kept by the Superintendent, in which the names of the inmates so engaged, the kind of work done by them, and their general conduct when employed, shall be regularly kept, to be submitted to the Visiting Commissioner or other Official Visitor on each visit. Inmates refusing or neglecting to perform such work as they are ordered to perform will subject themselves thereby to the punishments named in Rule 45.

41. The daily arrangements shall be as follows:—

At 7 A.M.—Coffee and bread.

From 8 A.M. to 10 A.M.—Work or occupation. Schools for boys or girls.

At 11 A.M.—Breakfast.

From noon to 3 A.M.—Work or occupation. School for boys or girls, and for those adults who choose to attend

At 4 P.M.—Dinner.

42. The issue of tobacco, wine, beer, and spirituous liquors, or opium, shall be determined by the Medical Officer alone, from time to time, and no order shall be in force for more than one week. No such articles are to be issued except under the orders of the Medical Officer; and the use of such articles, however obtained, is strictly prohibited without his previous permission and sanction.

43. The Male inmates are forbidden to enter at any time the Wards or Yard of the Female inmates; and Female inmates are forbidden to enter at any time the rooms of the Male inmates. Every breach of this Rule will be punished according to these Rules.

44. No inmates are ever to leave the grounds of the Asylum without the written permission of the Superintendent.

45. Every inmate who refuses or neglects to perform the duty or work assigned to him or her, or who is guilty of misconduct, or of any infraction of these Rules, shall, for each offence, be subject to be deprived of tobacco, wine, beer, spirits, or opium for any time not exceeding six months, on the order of the Medical Officer, or of the Superintendent.

46. Disorderly inmates shall, for the maintenance of quiet, be confined in a separate room, and receive only bread and water, or such other diet as the Medical Officer may direct.

47. Any inmate of the Asylum found outside the fences of the Asylum, not having been lawfully discharged therefrom, or having a written permission from the Superintendent to be absent from the Asylum, shall be arrested by any Police Constable, and conveyed as early as may be practicable to the Asylum.

48. The Dietary of each Asylum will be regulated from time to time by special orders; and no alterations, except in the case of sick patients, as provided for by Rule 8, shall be made in the Dietary without the consent of the Government Secretary.

Published this Fourteenth day of October, 1876.

By Command,

WILLIAM A. G. YOUNG,

Government Secretary.

The above were subsequently altered by making the Surgeon the Superintendent, and responsible for the entire management of the Asylum.—*J. D. H.*

BRITISH GUIANA LEPER ASYLUMS.

His Excellency the Governor has been pleased, in exercise of the power contained in Ordinance No. 18 of the year 1870, to make the following Rules and Regulations for the control and management of the Leper Asylum at Kaow Island:—

CONTENTS.

1. This Asylum shall be subject to the inspection of the Surgeon-General, the Inspector of Prisons, the Special Commissioner for visiting Leper Asylums, the Chairman of the Poor Law Board, and such other official visitors as may be from time to time appointed by the Governor, who may visit the Asylum at any time, and make such remarks as they may deem proper in a book to be kept at the Asylum, and called the Visitors' Book, copies of which remarks shall be sent to the Government Secretary, as soon after as conveniently may be, by the Superintendent of the Convict Prison at Massaruni.

2. The Asylum shall be visited at least once in every two months by the Inspector of Prisons, or some other official visitor appointed for that purpose.

3. The Inspector of Prisons, or other official visitor, shall, on every such visit, inspect the cottages of the inmates and see if they are in good order and clean. He shall also inspect the Journal to be kept by the Medical Officer, and shall ascertain that the visits of the Medical Officer have been regular; and shall on his return to town report in writing to the Government Secretary any matters that require attention.

4. The Inspector of Prisons shall, on every such visit, examine into any complaints made by any inmate of the Asylum, and take such action thereon as to him may seem proper.

5. The Inspector of Prisons shall, on every such visit, hear any application which may be made by any inmate for leave to quit the Asylum, and may, if it appears that the applicant has some means for providing for himself, grant leave to any such inmate to quit the Asylum.

6. The Inspector of Prisons shall, in the month of January in each year, furnish to the Government Secretary a Report upon the Asylum for the preceding year, with such suggestions as he may deem proper to bring under the consideration of the Government.

7. The Asylum shall be under the general superintendence of the Superintendent of the Convict Prison at Massaruni, herein referred to as "the Superintendent."

8. The Superintendent shall visit the Asylum as often as he deems it necessary.

Two visits at least shall be paid in each month; and in the event of the Superintendent being hindered by any cause from visiting the Asylum, he shall direct the Assistant Superintendent to visit in his place; and on such visit the Assistant Superintendent may exercise all the powers given to the Superintendent by these Rules.

9. The Superintendent shall have full control over the Dispenser and all Attendants employed at the Asylum, and may order them to pay any fine not exceeding ten shillings, or may discharge them for sufficient cause, subject to the approval of the Governor.

10. The Superintendent may order any disorderly inmate refusing to obey the Rules of the Asylum, or assaulting or threatening to assault any officer, or using abusive language to any officer, to be shut up in a separate room, either on Kaow Island or at Massaruni, for such period, not exceeding fourteen days, as may appear necessary; and any inmate of the Asylum so shut up for misconduct, shall be deprived of all indulgences, such as wine, spirits, or tobacco, and shall receive only bread and water, or such diet as the Medical Officer may approve.

11. The Superintendent shall keep a journal for the Asylum, in which he shall note all reports made to him of misconduct on the part of any persons employed at, or any inmates of, the Asylum, and shall also note the course taken on each such report, and the punishment, if any, inflicted upon the offending party. This Journal shall be always open to the inspection of the Inspector of Prisons, or other official visitor appointed under these Rules.

12. The Superintendent shall, in the month of January in each year, make a general report upon the Asylum for the preceding year, and shall send therewith the report made by the Medical Officer as hereinafter required.

13. The Medical Officer in charge of the Asylum shall visit the Asylum at least once in every forty-eight hours (Sundays excepted), and oftener when necessary.

14. He shall keep a Case Book, in which he shall enter the name of every inmate admitted into the Asylum, and the date of his admission, his age, country of birth, colour, previous occupation, and actual condition when admitted.

15. He shall order in writing such medicines and diet as he may think proper for every individual inmate, but he shall not alter the general diet tables referred to herein.

16. He shall endeavour, by careful experiments, to be recorded in the Case Book, to ascertain what method of treatment is best calculated to cure or relieve Leprosy, and shall from time to time, as he thinks proper, recommend such alterations of the dietary as he may think best for the inmates, which recommendation shall be transmitted to the Goverment Secretary, through the Superintendent.

17. He shall personally perform every surgical operation that may be necessary in any case under his care.

18. He shall inform the Superintendent as early as possible of any offences or breach of the Rules which may come to his knowledge, also of any want of cleanliness or order in the Cottages, which can reasonably be avoided.

19. He shall keep a Journal of the principal events which occur at the Asylum, and shall enter therein the date of every visit he makes to the Asylum, and any orders he may think it right to give to the Dispenser.

20. The Case Book and Journal of the Medical Officer shall be kept in such form as may be approved by the Governor, and shall be submitted to the Inspector of Prisons at his visits, and shall be sent to the Special Commissioner for visiting Leper Asylums when required by him.

21. He shall make a Report within the first fourteen days of each year of the diseases and deaths which have taken place in the Asylum in the preceding twelve months, and shall append thereto a general sanitary record of the Institution, which Report shall be transmitted to the Government Secretary through the Superintendent.

22. The Dispenser shall reside on Kaow Island, and shall not absent himself therefrom, except to go to Massaruni, without leave from the Superintendent.

23. He shall, under the direction of the Superintendent, have charge of the Asylum, and shall use his endeavours to maintain good order among the Lepers, and cleanliness in their houses, persons, and clothing.

24. He shall take care that the Orders of the Medical Officer are strictly carried out.

25. He is to visit every cottage once in the day, and inquire into the condition of any sick inmate.

26. He shall see that the meals of the inmates are properly served out according to the dietary in use, or such special diet as may have been ordered by the Medical Officer.

27. Any allowance of wine, beer, or spirits, made by order of the Medical Officer to any patient, is to be consumed in his presence.

28. He will direct the attendants in their several duties, and will report any misconduct on their part to the Superintendent.

29. He shall, whenever an Inmate dies, send notice to the Medical Officer of the event. If the Inmate should die in the night, a messenger is to be be despatched with a report of the death to the Medical Officer before 10 A.M.

30. If any inmate shall quit the Asylum without leave, he shall forthwith give notice thereof to the Superintendent.

31. The attendants are to see that the Cottages are cleaned before 8 A.M., and are to attend to the bedridden inmates. They are to take care that the clothes and bedding of the inmates are kept as clean and in as good repair as possible, and they are to report any improper conduct to the Dispenser.

32. The inmates of the Asylum are required to conduct themselves in a quiet and orderly manner, and to obey at all times the directions of the Superintendent, the Medical Officer, and the Dispenser.

33. They shall, unless disabled by sickness, rise at 6 A.M., and arrange their beds, remove their chamber utensils, and wash and clean themselves before 7 o'clock.

34. They shall retire to their cottages at 7 P.M.

35. The inmates must use with care, and not injure the body and bed-clothing which is provided for them. They may wear any articles of clothing supplied to them by their friends.

36. Their cups, plates, knives and forks shall be kept clean. No articles liable to decomposition shall be kept inside any cottage.

37. All the inmates are required to engage in such work or employment, in or

for the benefit of the Asylum, in such capacity, and for such length of time as the Dispenser, with the approval of the Medical Officer, may direct. A Work Book shall be kept by the Dispenser, in which the names of the inmates so engaged, the kind of work done by them, and their general conduct when employed, shall be regularly kept; and this book shall be open to the inspection of the Inspector of Prisons, or other Official Visitor, on such visit. Inmates refusing or neglecting to perform such work as they are ordered to perform will subject themselves thereby to the privations herein ordered.

38. Tobacco, wine, beer, spirituous liquors, and opium are luxuries, which shall only be issued to well-conducted inmates. No inmate has any right to any allowance of any of these articles. The quantity that may be issued to each inmate is to be determined by the Medical Officer alone, from time to time, and no order shall be in force for more than one week. No such articles are to be issued except under the orders of the Medical Officer; and the use of such articles, however obtained, by any person to whom they have not been issued, is strictly prohibited.

39. Every inmate who refuses or neglects to perform the duty or work assigned to him or her, or who is guilty of misconduct, or of any infraction of these Rules, shall for each offence be subject to be deprived of tobacco, wine, beer, spirits, or opium, for any time not exceeding six months, on the order of the Medical Officer, or of the Superintendent.

40. Disorderly inmates shall, for the maintenance of quiet, be confined in separate rooms, either at Kaow Island, or at Massaruni, as the Superintendent may order, and shall receive only bread and water, or such other diet as the Medical Officer may direct.

41. Inmates desiring to leave the Asylum are to apply for permission to the Superintendent.

42. The Dietary of the Asylum will be regulated from time to time by special orders; and no alterations, except in the case of sick patients, as provided for by Rule 15, shall be made in it without the consent of the Government Secretary.

Published this 4th day of November, 1876.

By Command,

WILLIAM A. G. YOUNG,
Government Secretary.

AN ORDINANCE to establish an ASYLUM for LEPERS, and to provide for their CARE and MAINTENANCE therein.

Ordinance enacted by his Excellency WILLIAM WALKER, Esquire, Lieutenant-Governor and Commander-in-Chief in and over the Colony of British Guiana, Vice-Admiral and Ordinary of the same, &c. &c., by and with the advice and consent of the Honourable the Court of Policy of the said Colony.

To all to whom these presents do, may, or shall come, greeting: Be it known—

Preamble.

WHEREAS there is reason to apprehend that the disease called Leprosy has of late years increased in this Colony, and it is expedient to make provision for the care and maintenance of persons so afflicted in certain premises at Mahaica, which have been purchased by the Colony for the purpose of there establishing a general Leper Asylum for the Colony of British Guiana: Be it therefore enacted by his Excellency the Lieutenant-Governor of British Guiana, with the advice and consent of the Court of Policy thereof, as follows:—

Governor may establish by proclamation a general Leper Asylum at Mahaica.

1. It shall be lawful for the Governor, by proclamation under his hand and seal, to be published in the *Official Gazette* and one other newspaper of the Colony, to declare that the premises situate on the west bank of the Mahaica Creek, in the county of Demerara, and recently occupied as a military post, with the lands thereto attached, shall be, according to the extent, limits, and boundaries thereof, as defined by a diagram of the Crown Surveyor deposited in the Registrar's office for the counties of Demerara and Essequibo, a general asylum for lepers for the Colony of British Guiana.

Leper Asylum to be under control of the Poor Law Commissioners.

2. The said asylum shall be under the general control and superintendence of the Poor Law Commissioners appointed under Ordinance No. 6 of the year 1855.

Appointment and salaries of officers.

3. It shall be lawful for the Governor to appoint a medical practitioner, a resident superintendent, and a sufficient number of nurses and attendants for such asylum, with such salaries and allowances respectively as the Governor and Court of Policy, with the financial representatives in combined court assembled, shall from time to time vote for such purpose.

Wards for patient capable of paying

4. The Poor Law Commissioners shall set apart one or more wards of the asylum for the accommodation of persons afflicted with leprosy who, not requiring gratuitous relief, may be desirous of becoming inmates of the asylum; and such wards shall be kept distinct from the other wards of the asylum; and any person

afflicted with leprosy producing a recommendation from any justice of the peace and paying in advance such monthly sum as shall be from time to time agreed upon between such person and the Poor Law Commissioners, shall be admitted into the said asylum, and shall be entitled to receive and enjoy all the advantages of patients in said asylum.

Admission of paupers afflicted with leprosy.

5. From and after such proclamation aforesaid, every person resident in this colony afflicted with leprosy and requiring gratuitous relief shall, on his or her application to the medical practitioner of the asylum, or on the order of the Poor Law Commissioners, or any two justices, made on the application of any person so afflicted, be entitled to admission into and be received as an inmate of such asylum, free of charge.

Leper exposing his person in any public place may be summoned before a stipendiary or special justice.

6. From and after such proclamation, it shall be lawful for any stipendiary or special justice of the peace, upon information on oath of any credible witness that any person afflicted with leprosy has been seen wandering about begging or collecting alms, or seeking precarious support, or exposing his or her person in any public road, street, or place, to summon such person to appear before him ; or if he shall think it necessary, such justice shall issue a warrant under his hand, directed to any constable or officer of police, authorising and directing such constable or officer of police to cause any such person to be brought before him, at a time and place to be specified in such summons or warrant.

On the hearing of the case, justice empowered to make an order of removal to the asylum.

7. If upon the hearing of the case it shall be made to appear to the satisfaction of the said justice, upon the oath of any medical practitioner duly admitted to practise in this Colony, that such person is afflicted with leprosy ; and if it shall be made further to appear upon the oath of some credible witness that such person has been seen wandering abroad begging or collecting alms, or seeking precarious support, or exposing his or her person in any public road, street, or place, then it shall and may be lawful for such justice, unless security be given as hereinafter provided, to make an order, directed to any constable or officer of police, and to the resident superintendent of the Leper Asylum, ordering and directing such constable or officer of police to remove and convey such person to such asylum, and authorising and directing the resident superintendent to keep and detain such person as an inmate of such asylum, until he or she shall be discharged by order of the Governor, as hereinafter mentioned.

No such order to be made if security given for the treatment of the leper in private.

8. If upon the hearing of the case, the person so afflicted, or any one on his behalf, shall give security to the Poor Law Commissioners, by a bond to their satisfaction to the extent of ninety-six dollars, that such person shall be properly maintained and treated in private, and shall not be suffered to be at large or

to endanger the public health, the said justice shall abstain from making an order of removal.

Leper, when cured, to be discharged from the asylum.

9. Whenever it shall appear to the medical practitioner of the Leper Asylum that any inmate thereof may be discharged without danger to the public health, such medical practitioner shall certify the same to the Governor; and thereupon it shall and may be lawful for the Governor to direct that such person shall be discharged.

Leper, although not cured, may be discharged on giving security for his treatment in private.

10. If at any time any inmate of the said asylum, although not cured, or any person on his behalf, shall give security to the Poor Law Commissioners, by a bond to their satisfaction, to the extent of ninety-six dollars, that such inmate shall be properly maintained and treated in private, and shall not be suffered to be at large or to endanger the public health, the said Commissioners shall forthwith report the same to the Governor and obtain his order for the discharge of such inmate from the said asylum.

Power of appeal to a Judge of the Supreme Court.

11. In case any person ordered to be removed to such asylum, or in case any person detained therein shall at any time be desirous of appealing from such order or such detention, such person may present a petition for appeal to any one of the Judges of the Supreme Court of the Colony, without charge or expense, which Judge shall have full power and authority to inquire into such appeal, and to cause such witnesses to be examined before him as he may consider necessary, and thereupon to make such order for the discharge of such person from the said asylum, or otherwise, as he may consider meet.

* * * * * *

Punishment of any person assisting or abetting in the removal of an inmate of the asylum without authority.

13. If any person shall aid, assist, or abet any inmate of the Leper Asylum in removing or attempting to remove therefrom before he shall have obtained the order of the Governor for his discharge, every such person shall be guilty of a misdemeanour, and shall be liable, on conviction, to a fine not exceeding ninety-six dollars, or to imprisonment, with or without hard labour, not exceeding three months, or to both such fine and such imprisonment with or without hard labour; and all prosecutions under this section shall be instituted in the name of the Poor Law Commissioners, and may be heard and determined by the Inferior Court of Criminal Justice for the county of Demerara.

Punishment in case of wilful employment of any leper in sale of food.

14. No person afflicted with leprosy shall be in any way employed, whether for hire or not, in the preparation for sale, or in the sale of any article of human food; and in case any such person shall be so employed, the person knowingly employing him shall be guilty of a misdemeanour, and shall be liable on conviction, to the same punishment by the aforesaid Inferior

Court of Criminal Justice as is provided in the preceding section.

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When Ordinance to take effect.

21. This Ordinance shall come into operation and take effect on the publication thereof.

And that no ignorance may be pretended of this our Ordinance, these presents shall be printed and published in the customary manner.

Thus done and enacted at our adjourned assembly, held at the Guiana public buildings, Georgetown, Demerara, this twenty-second day of March, One thousand eight hundred and fifty-eight, and published on the twenty-fourth following.

WILLIAM WALKER.

By command of the Court,

J. GARDINER AUSTIN,
Acting Secretary.

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