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G.O., DATED 14. 11. 89

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Confidential 162
1889.

[Despatch Abstract.]

Acproy Distributing copies of
a work ~~in~~ ^{by} Messrs.
Ernest Barnes translated by
Surgeon Major Baker, Civil
Surgeon, Malabar.

Public DEPARTMENT.

Confidential No. 495

From

The Govt. of India
Home Dept.

No. 692

Dated 25. 10. }
Received 4. 11. } 89

Enclosures One + 9. S. C. P. 1911

SUBJECT.

Forwarding translation of work on
leprosy to Messrs. Ernest Beaman for
distribution

Surgeon Genl with the 40th
— 1000th Forces thro
the City Hosp.
Sanitary Comm.
D. J. Sanitary Comm.

(Confidential.)

No. 692

FROM

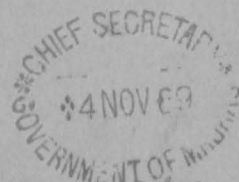
C. J. LYALL, ESQ., C.I.E.,

Offg. Secretary to the Government of India,

To

*The Chief Secretary to the Government
of Madras*

Home Department.
Medical.



Simla, the 25 October 1889.

SIR,

I AM directed to forward 10 copies of a translation of a work on leprosy by Mons. Ernest Besnier, with an introduction by the Translator, Surgeon-Major O. Baker, late Civil Surgeon of Moulmein, and to request that, with the permission of *His Excellency the Governor in Council* they may be distributed among selected medical men through the Head of the Medical Department in the *Madras Presidency*. I am to say that the Governor General in Council, while recognising that the circulation of the work may be of material aid in the efforts at present being made by the Government to deal with leprosy in India, desires that the distribution of the copies now forwarded should, until further orders, be confidential and restricted solely to the officers who may be selected by *His Excellency the Governor in Council*. The attention of these officers should be drawn to the remarks contained in the work as to the possible communicability of leprosy by vaccination, and they should be enjoined to take particular care to avoid communicating the remarks on this point to unprofessional persons, lest they should create a prejudice in the minds of the people against vaccination. I am to add that this matter is being thoroughly enquired into by Surgeon-Major D. D. Cunningham, Professor of Physiology in the Medical College, Calcutta.

If the view taken by M. Besnier is correct, it affords an additional argument of great force in favour of the use of lymph taken direct from the calf instead of from human beings.

I have the honour to be,

SIR,

Your most obedient Servant,

Offg. Secretary to the Government of India.

Govt. of {1889} Madras.

PUBLIC.

CONFIDENTIAL.

Issued

Recd.

Encl.

G.O., 14th November 1889, No. 921.

NOVEMBER.

Leprosy.

Distributing copies of a work on — by Monsieur Ernest Besnier, translated by Surgeon-Major Baker, Civil Surgeon, Moulmein.

14TH NOVEMBER 1889, No. 921, PUBLIC.

CONFIDENTIAL.

GOVERNMENT OF MADRAS.
PUBLIC DEPARTMENT.

READ—the following paper—

From C. J. LYALL, Esq., C.I.E., Officiating Secretary to the Government of India, Home Department (Medical), to the Chief Secretary to the Government of Madras, dated Simla, the 25th October 1889, No. 692.

I am directed to forward 10 copies of a translation of a work on leprosy by Monsieur Ernest Besnier, with an introduction by the Translator, Surgeon-Major O. Baker, late Civil Surgeon of Moulmein, and to request that, with the permission of His Excellency the Governor in Council, they may be distributed among selected medical men through the head of the Medical Department in the Madras presidency. I am to say that the Governor-General in Council, while recognising that the circulation of the work may be of material aid in the efforts at present being made by the Government to deal with leprosy in India, desires that the distribution of the copies now forwarded should, until further orders, be confidential and restricted solely to the officers who may be selected by His Excellency the Governor in Council. The attention of these officers should be drawn to the remarks contained in the work as to the possible communicability of leprosy by vaccination, and they should be enjoined to take particular care to avoid communicating the remarks on this point to unprofessional persons, lest they should create a prejudice in the minds of the people against vaccination. I am to add that this matter is being thoroughly inquired into by Surgeon-Major D. D. Cunningham, Professor of Physiology in the Medical College, Calcutta.

If the view taken by Monsieur Besnier is correct, it affords an additional argument of great force in favor of the use of lymph taken direct from the calf instead of from human beings.

ORDER—dated 14th November 1889, No. 921, Judicial.

Of the 10 copies of the work on leprosy forwarded with the letter read above, one will be retained in this office, and four will be communicated confidentially to the officers named in the margin. The Surgeon-General with Government will be requested to advise as to the distribution of the remaining five copies.

Surgeon-General with Government.
Surgeon-General, Her Majesty's Forces.
Sanitary Commissioner.
Deputy Sanitary Commissioner.

(True Extract.)

J. F. PRICE,
Chief Secretary.

To the Surgeon-General with Government.
" Surgeon-General, Her Majesty's Forces,
" through the Military Dept. } with copies of the book.
" Sanitary Commissioner.
" Deputy Sanitary Commissioner.

Exd. E. Fernandez.

Public 3513/89

ON LEPROSY.

NATURE, ORIGIN, TRANSMISSIBILITY, THE METHODS OF
PROPAGATION AND TRANSMISSION.

BY

M. ERNEST BESNIER,

MEMBER OF THE ACADEMY OF MEDICINE AND PHYSICIAN TO THE ST. LOUIS HOSPITAL.

Read in the Academy of Medicine at a meeting held on the 11th of October 1887.

TRANSLATED BY

OSWALD BAKER,

SURGEON MAJOR, INDIAN MEDICAL SERVICE.



CALCUTTA:

PRINTED BY THE SUPERINTENDENT OF GOVERNMENT PRINTING, INDIA.
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ON THE NATURE, ORIGIN, AND TRANSMISSIBILITY
OF LEPROSY.

INTRODUCTORY REMARKS.

I. The facts brought together by M. Besnier on the origin and transmission of leprosy are both instructive and interesting. More especially are they of particular importance to the Indian Medical Officer, because in the performance of his every-day duties he is constantly coming into contact with leprosy, and often has to take charge of lepers in Jails, Hospitals, and Asylums.

Whether leprosy is on the increase or the decline in India proper, where it is so very prevalent, is a question on which I can form no opinion; but with regard to Burma, I say without fear of contradiction that the malady is at the present day displaying considerable activity, and that the disease is much more common than is generally believed.

Not very many years ago, a distinguished Indian Medical Officer, who had served in Burma, publicly stated, at a meeting of one of the London Medical Societies, that leprosy was seldom or never met with among the Burmese. If leprosy had been as prevalent at the period to which his observations referred as it is now, the frequency of the disease could not possibly have escaped his notice.

And not only is the malady very prevalent among the Burmese themselves, but Burmese Eurasians are suffering in considerable numbers, while European residents are not entirely free.

It must be remembered that Burma is a country which has been subject to British rule but for a comparatively short space of time; the Eurasian element of the population is for the most part of recent origin, and that the disease is of frequent occurrence among this class of the community is an incontestable proof of its growing potentiality.

It is quite impossible to ascertain the real degree of prevalence of leprosy, because a Burman known to be a leper is shunned, and therefore concealment of the malady, when concealment is possible, is almost universal.

At the last annual election of Municipal Commissioners in Moulmein, an objection was lodged against the candidature of a Burman, by some of his fellow-countrymen, on the suspicion that he was a leper.

No searching investigation, however, is necessary to establish the fact that the disease is very common, for every town has its outcast leper population. And that I have under my treatment, at the present moment, several young Eurasians suffering from the malady, supplies further proof of this prevalence.

II. The cause of leprosy is no longer an undetermined factor. We are to-day perfectly satisfied that the disease results from the presence of a micro-organism known as Hansen's bacillus, and to this alone.

The testimony offered on this point by M. Besnier is overwhelming, and no thoughtful reader of the pages of his paper could get up from the perusal of them without discarding all pre-existing doubts on this subject.

The main facts on which he dwells are, that the micro-organism is a definite, specific, bacillus, which is to be found in nearly every leprosy lesion, and

is never, under any circumstance, to be found elsewhere; that no condition of soil, no locality, no climate, and no description of food can, in the absence of the bacillus, produce the disease; that mankind alone is subject to the malady, and from mankind only can it be acquired.

III. With regard to the actual manner in which leprosy is transmitted, the evidence is less clear.

It is certain that the bacillus is the exciting and only cause of leprosy, but by what channels the micro-organism gains access to the body is not yet fully ascertained.

Accidental inoculation arising from actual contact with leprosy persons is undoubtedly one of the commonest of the methods by which leprosy is propagated; and this, fortunately, needs special conditions for its fulfilment.

What these conditions are will be presently pointed-out, for mere contact with a leper is not of itself sufficient to transmit leprosy.

M. Besnier affirms that the bacillus of Hansen is incapable of penetrating the outermost layers of the skin, so that a leper may be suffering from leprosy to a severe degree, but if he has not an ulcer, or a wound, or some break in the continuity of his skin, his bacilli are locked up, so to speak, within himself, and actual contact with him implies no exposure to contagion.

On the other hand, a healthy man may be the constant associate of lepers, may live with a leprosy wife, may bring up leprosy children, and, provided the necessary conditions are not fulfilled, he also may escape exposure to contagion.

The required conditions are, precisely those which are necessary for successful vaccination; that is to say, the bacillus of leprosy, as the virus of vaccine, must be conveyed in the exudation from the leper's sore, or the vaccine vesicle, and inserted into the deeper layers of the skin—a break in the continuity of the epidermis being absolutely necessary.

How frequently these conditions are found would not occupy my attention were it not to support the view I take of the most common origin of leprosy. After all, the conditions necessary for the inoculation are few, simple, and often arise. Bacilli are found in nearly every leprosy lesion, and in tubercular leprosy of the surface of the body they are found in such overwhelming quantities as to sometimes obscure the histological features of the part they invade. In such cases an accidental scratch with a pin, or prick with a needle, or other trifling injury to the skin, and which, owing to the anaesthesia of the part, escapes attention, will liberate a drop of clear fluid containing hundreds of bacilli. Should a capillary be opened, some blood corpuscles will naturally escape with the fluid, otherwise the exuded fluid looks colourless as water.

Let this bacilli-laden fluid, either clear or mixed with blood, be conveyed by personal contact, or in any way, to a scratch, or abrasion, or sore, on a healthy person and inoculation is effected. No matter how early in the disease this accident may arise, the consequences are as fully fraught with danger to the inoculated person as if the leprosy lesion from which the bacilli came was of the most advanced and repulsive kind.

Such being the case, and remembering that, in its early stages, leprosy is difficult of recognition, it is easy to foresee how constantly the conditions necessary for inoculation must arise.

The incipient leper, ignorant of the meaning of the swollen and discoloured little patch which has appeared on the surface of his body, may be his hand, and, little imagining he is a possible cause of danger to those around him, takes no precaution to avoid becoming a source of contagion; while those with whom he lives, being equally oblivious of his condition, or, if acquainted with it, know not how easily the disease may be transmitted, associate with the sufferer through-

out the day, and possibly sleep with him at night. And in unrestricted companionship the victim of leprosy may live with his parents, his sisters and brothers for years, without any precaution being taken on either side to guard against the contagiousness of the disease.

And it is, in my belief, under these circumstances that leprosy is mainly propagated.

The outcast leper is not nearly so great a source of danger as the leper living at home with the disease in its initial stages, for the former is rightly regarded as an object of contagion, and personal contact with him, which is always shunned, seldom takes place.

That insanitary conditions favour the extension of leprosy is undoubtedly true, but I am unable to think that hygiene plays so important a part in arresting its spread as M. Besnier implies; and I do not think the example he has set, of taking into his service a man-servant suffering from leprosy, is one that should find many imitators.

No degree of filth, or overcrowding, or poverty, will generate a single case of leprosy, just as no measure of cleanliness, or pure air, or affluent circumstances, will arrest the development of a single case of successful inoculation. The strong and healthy, as in cow-pox and syphilis, are quite as susceptible to inoculation as, if not more so than, the weak and sickly. That overcrowding and general uncleanness render inoculation of more frequent occurrence there can, however, be no question.

IV. The evidence that M. Besnier adduces in favour of the possibility of conveying leprosy through vaccination, a veritable inoculation, is not sufficient of itself, or of such a nature, as to be convincing.

Because M. Arning has found leprosy bacilli in the vaccine lymph and crusts taken from lepers, and Dr. Gairdner has attributed to vaccination from a leprosy child two cases of the disease, M. Besnier therefore concludes that leprosy is to be transmitted through vaccination.

With regard to Dr. Gairdner's cases, it is said that one of the sufferers had spent the early part of his life in a leprosy country, and that the other had visited that country repeatedly, so that the possibility of their having acquired leprosy independently of vaccination must not be overlooked. M. Arning's experiences are of more value, but I certainly do think that before we can accept as an indisputable fact that leprosy is to be propagated through vaccination, we should demand some clearer and more positive proof than these results afford.

This question, which is of little concern to residents in non-leprosy countries, becomes to native races and dwellers in the East, where leprosy is prevalent, one of paramount importance; and that the subject has not been more fully investigated is a matter of regret.

Nothing would be easier than for a few independent microscopists to vaccinate some of the lepers found in Jails and Asylums, and, by comparing their results, to place the question beyond doubt.

Vaccinators, whose only qualification is that they are competent to vaccinate, are sent forth into the districts far away from any supervision, and return with a register of hundreds or thousands of operations they have performed with humanized lymph—whether they have spread leprosy as well as cow-pox by their vaccinations is a problem that scarcely admits of solution in a leprosy country—but that they were liable to do so, if M. Arning has not been deceived, there cannot be any manner of doubt.

My own endeavours to find bacilli in vaccine raised on lepers' bodies have signally failed, although the vaccination of the selected lepers was carried out under favourable circumstances.

That I was anxious to confirm rather than confute Arning's experiences

would tend to support my own impression that I was unlikely to overlook the bacilli.

Four lepers were operated on, with lymph conveyed direct from a cow-pox vesicle on a calf: in three of the cases successful vaccination resulted; but although I took lymph direct on to cover-glasses from all three cases, I could not find a vestige of a bacillus in any of my specimens.

In one case the ear, in another the forehead, and in the third the arm, were the chosen situations for the operations, the sites being selected solely with reference to the presence of characteristic patches of leprosy.

If, however, inoculation with Hansen's bacillus was the inevitable consequence of vaccination with lymph from leprosy children, surely leprosy would be much more common than it even now is.

Although M. Arning has found the bacilli in vaccine lymph taken from lepers, it does not follow that the bacilli are invariably, or even frequently, present in lymph so raised.

Nevertheless the possibility of there being a vaccination leprosy as there is a vaccination syphilis has, quite apart from Arning's discoveries, so deeply impressed me that in the town of Moulmein, where I am Health Officer, the use of humanized lymph has been almost altogether given up in favour of vaccination direct from the calf.

V. With respect to congenital or hereditary leprosy, the reader is referred, without comment of mine, to M. Besnier's pages, which I have rendered into English to the best of my ability.

The laws of heredity are so intricate that it is sometimes difficult to catch the precise meaning of the author.

VI. In bringing these remarks to a close, I would ask, is it not possible for measures to be taken to arrest to some extent the spread of this dreadful disease?

To see young lads suffering from leprosy and to know that, as in tuberculosis, nothing can be done to avert the fate that awaits them, is sufficient to arouse the feeling that it were better they had never been born.

(a) The first step that I would urge is to subject Arning's discovery of bacilli in vaccine lymph to the closest investigation at the hands of competent bacteriologists, and, if it be found that what he asserts does frequently occur, then let an immediate stop be put to vaccination with humanized lymph in this and other leprosy countries. Calf lymph can easily be raised in sufficient quantities for purposes of general vaccination, and although the liquid lymph is too unstable to keep for more than a short period of time, the vaccine crusts from the calves, as I have shown elsewhere (*vide* Sanitary Report for British Burma, 1884), will retain for some months all the active properties of fresh liquid lymph, and can be distributed through the districts as easily as humanized lymph now is. And this is a protective measure that is obviously capable of practical adoption.

(b) Not less important is a dissemination of the knowledge that, provided the conditions necessary for inoculation are present, leprosy at all periods and in all stages is readily contagious.

How few are aware of this fact is matter of every-day observation. Not long ago I felt it a duty to ask for the removal to some other occupation, of a butler, a confirmed leper, who was, and had been for years, a caterer and personal attendant at a public dinner table.

When small-pox breaks out in a family, the subjects of it are to some extent segregated and exposure to contagion is more or less avoided; surely precautions can be taken in the case of leprosy, not necessarily to the extent of prohibiting companionship, but by limiting it, especially in leprosy of the limbs

or face. Nor should another person ever wear a leper's clothes, sleep in a leper's bed, or expose himself to contact with a leper's sores.

(c) And, lastly, let every Municipality and Township provide for its outcast leper population. Let a home be found for these lepers where they can obtain shelter and food, and then prohibit their attendance at places where fairs are held, in bazaars, at pagodas and in the main thoroughfares of the town.

VII. I have to thank Mr. C. Law of Moulmein for assistance kindly given in the translation of several of the passages in M. Besnier's paper.

OSWALD BAKER,

Surgeon-Major.

MOULMEIN,

February 1889.

ON LEPROSY.

The discussion on Leprosy which took place in this Academy in 1885 brought to light innumerable imperfections in our knowledge of this the earliest and commonest of human maladies; and the same defectiveness is apparent in regard to all ancient diseases: when examined by the light of the science of to-day, the poverty of our knowledge respecting them is laid bare in its naked reality, and one stands amazed at the smallness of the results obtained after the lapse of so many centuries; and more especially since, by a truly startling contrast, this new science, the growth of yesterday, supplies us in profusion with the most unexpected facts and the most vivid flashes of light.

Be this as it may, the movement must be followed; submission must be given to its revelations; new words must be applied to new facts, or, if the old phraseology be retained, such significance must be given the words as is necessary by reason of new facts.

An academical discussion which, in the light of recent discoveries, continues to be carried on in old grooves, ceases to be in harmony with the science of the day, which is based on known facts and recorded observations, the result of the most perfect methods of investigation in the domain of histology and bacteriology. Under such circumstances, gentlemen, the Treatise on Leprosy by M. Leloir comes before us, a work which furnishes the starting point and is the basis of the present brochure. During nearly the whole of the past ten years, this able young man, in the active pursuit of medical science, compiled the materials for a work which he has just brought out, and which of itself is sufficient to render the name of any physician illustrious. His earliest researches on leprosy date back to 1878; they were begun at the St. Louis Hospital, a field without its equal in the world, where lepers permanently reside, and where the rare opportunity is afforded of seeing leprosy from all countries and in all its stages. It is easy to understand what an excellent field for research this was, as here the identity of the dreadful disease through its varied types, forms, and varieties could be realized at a glance.

This work of M. Leloir, which was deposited in the library of the Academy in manuscript in February 1886, was published in the month of July of the same year, and every one having had the opportunity of becoming acquainted with it, I should not, as a matter of duty, have made these references to the work, but, on the one hand, it seemed to me to be unjust not to pay a certain tribute to a work of this importance, and, on the other hand, as leprosy is the subject of my discourse, I felt it incumbent on me to allude to it as a pretext for again bringing the subject of leprosy before the society after so brief an interval as two years: for, notwithstanding the efforts of my learned colleague and friend M. Vidal, the Academy has not, in my opinion, formed a judgment on the question in a manner worthy of the present state of our scientific knowledge, and in proof of which I have no hesitation in appealing from itself to itself.

Two points in the history of leprosy especially force themselves on our attention, one being the nature of the disease, and the other its origin and mode of propagation. These two points I would discuss before the Academy.

I.—The nature of Leprosy; Hansen's bacillus, its situation in the liquids and solids of the body.

In all the types, forms, and varieties without exception of the leprosy malady, which have been diagnosed by clinical observation, histology easily establishes the presence of a characteristic bacillus, the discovery of which belongs to A. Hansen, of Bergen, and which can justly be called Hansen's bacillus.

But for trifling differences, as to disposal in the tissues, and measurement, the bacillus of leprosy is identical with the bacillus of tuberculosis, and from their appearance alone they may easily be confounded; but by staining they are readily distinguished, and a contrasted numeration suffices to differentiate them, the leprosy bacillus being, in preparations generally, incomparably more numerous than the tubercle bacillus.

These ascertained facts being established, it is necessary to add that the history of the microphyte of leprosy is not complete, that the position held by the bacillus among the germ series is not definitively fixed, and that the discussion is yet open on some points, especially on the question of its development, of the presence or absence of a sheath, of its position (as to whether it is within the cells or without them, or whether it is sometimes within and some-

times without), on the value of the artificial cultivations which have been made, as well as on the inoculations which have been attempted.

These unknown points, of which the solution is close at hand, do not detract in any way from the value of Hansen's discovery, nor from the authenticated indisputable bacteriological results unanimously arrived at by all histologists; and at the present time a description can be given, of an almost complete nature, of the situations selected by the leprosy bacillus in the liquids and solids of the organism.

The situation of Hansen's bacillus in the liquid and solid media of the body.

To obtain a clear idea at the beginning of what leprosy is, it is necessary to become acquainted with the situations in which of Hansen's bacillus is found; and this makes it all the more necessary to point out that authors, who have collected information on this question, have altogether omitted to give a systematic and clear description of these situations, a point which is, however, indispensable to the popularising of the subject.

1st.—Liquids of the body.

A. The blood.—At no stage in the protracted course of leprosy does the blood permanently contain the bacillus; if, as is very probable, some micro-organic element of the disease circulates with the blood during febrile exacerbations, this element has not yet been discovered. What alone is settled is that the bacillus is absent.

Experience shows that when micro-organisms are introduced into the circulating blood they rapidly disappear, and this is only what may be expected in the case of leprosy. The blood is to them merely a means of transport, by which they become scattered and deposited in situations where they become stationary—that is to say, in the capillaries of the blood vessels where the circulation is autonomous and slow; here they cannot remain beyond a very short time; they cannot be suffered here without producing conditions which are incompatible with organic life; in all cases where their presence is even for a short period experienced we see at once vital re-actions produced, fevers, fits, &c., such as characterize all germ diseases wherein the blood becomes occasionally contaminated by the presence of germs.

B. The lymph.—Here without doubt in situations where the lymph can stagnate—the radiating net-work of the skin, spaces in areolar tissue, lymphatic sheaths or channels of nerves, and glands, &c., here the most perfect cultivating media for the bacilli of leprosy is to be found—the bacillus is not, however, invariably met with in all these situations, but only in such of them as have a definite affinity for the bacillus; in the same way syphilis, cancer, and tuberculosis attack some of, but not necessarily all, the structures alluded to; whence it follows we shall shortly be able to propose a comparative table giving the chosen territory of each disease.

C. The healthy and pathological secretions and excretions.—For such time as the secretory organs remain in a healthy condition, they do not eliminate the germs of leprosy, or at least eliminate no bacilli; but as the glandular apparatus is rarely attacked by leprosy, so is it equally rare to find the bacillus in the liquid secretions, and such being the case, it is easy to see how limited are its means of transmission.

In no instance are bacilli ever found in the urine, and it is all the more desirable to draw attention to this circumstance because the Chinese hold the belief that the urine is the vehicle of contagion.

The tears, the mucus from the nose, and the saliva swarm with bacilli whenever the surfaces of the eyes, nose, or mouth are affected by the disease.

The same may be said in respect to the liquids and solids passed by the bowel in the diarrhoea of leprosy, when the large intestine or rectum is affected.

The uterine mucus and the vaginal secretions never contain the leprosy bacillus. I have no need to draw attention to the importance of this fact as showing the harmlessness of intercourse with leprosy women. The semen certainly contains the bacilli by reason of the frequency and early growth of disease in the testicles.

The pathological exudations from the immediate vicinity of parts affected with the leprosy growth or deposit, be they blisters or bullæ, known as leprosy pemphigus, or which ooze from the surface of leprosy ulcers and gangrene, contain the bacilli in greater or less abundance; on the other hand, the bacilli are not commonly found in the smooth erythema of leprosy—leprosy roseola—any more than in the fluid from bullæ or other conditions possessing the same origin; that is to say, in the distant vaso-motor or tropho-neurotic lesions set up by nerve inflammations in cases of leprosy of the nerves, nor even in those which are more closely connected with primitive leprosy multiple neuritis of the same description of leprosy.

Can liquid vaccine taken from a leprosy subject contain the bacilli? Yes, according to the experiences of Arning, who has found the bacilli in the vaccine lymph and crusts of lepers whom he vaccinated for the purpose of determining this question.

We shall see further on that the possibility of transmitting leprosy by vaccination may be considered established in the affirmative, and that there is as certainly a vaccination leprosy as there is a vaccination syphilis. But allowing such to be the case, one may hold the opinion that the exposed lesions of syphilis, chancres and surface sores may become the hidden seat of the bacilli or other germ elements of leprosy, and having this belief, be able to supply a plausible explanation of the frequency and persistency with which syphilis is generally regarded as the factor, or provoking agent, of leprosy in all the new foci of America and Oceania.

2nd.—Tissues, Organs, and Appendages.

A. The skin.—In the skin the bacillus is everywhere found, but particularly in the nutrient layers of the chorion, the lymphatic net-work and spaces, the vicinity of the capillaries, and the ultimate ramifications of the nerves. Unless injured, the epidermis proper remains untouched, and the intermediate layers of the skin form a barrier to the passage of the bacillus, so that one is able to infer that the integument is not probably subject to penetration by the bacillus, and, since the bacillus is not capable of escaping from within to the external surface, the contagiousness of leprosy by contact should be but little believed in. And, in a general way, the same immunity exists for the different organs of the skin, the hair-follicles and sebaceous follicles and glands, there being, as we shall see immediately, a remarkable analogy between the cutaneous organs of elimination and the kidneys.

B. The mucous membranes.—The secretory mucous membranes of the eye, the nose, and buccal pharynx abound with bacilli in the majority of cases of leprosy of the integument or of mixed leprosy, but the visceral mucous membranes, properly speaking, notwithstanding the constant presence in the alimentary tract of bacilli, become no more affected than in syphilis, exception being taken, however, for the mucous membrane of the rectum and large intestine.

Further, it is equally worthy of remark that the mucous membrane of the uterus, vagina and connexions remains free, the bladder in particular being, as M. Sappey has shown, without lymphatics, to which cause its immunity is due not only as regards leprosy, but also in a number of other diseases.

There is scarcely any exception to this save in the case of Koch's bacillus, *i.e.*, the tubercle bacillus.

C. Blood vessels.—The capillaries of the invaded regions are encompassed or blocked up with bacillary emboli, and show all the changes found in arteritis and phlebitis, as well as periarteritis and peri-phlebitis.

D. Lymphatic vessels.—The lymph vessels and glands are the essential and invariable home of the bacilli, according to Unna, Hansen, Nesser, Cornil, Arning, &c.; and Leloir has satisfied himself of these bacteriological changes and has proved their constancy.

E. Nervous system.—In leprosy, contrary to what takes place in syphilis, the central nervous system remains comparatively free, the bacilli have not yet been found there, and marked changes of any kind are rare, or are of the nature of such as are secondary to the peripheral lesions. Nevertheless the question must not be considered closed, for negative results may mean simply an insufficiency of investigation. It is only in the nerve cords beyond the plexuses, or in the ultimate ramifications of nerves of the second order, that the specific lesions due to the bacillus are found, as has been fully demonstrated by Hansen and others.

However, as to the precise order in which situations attacked by the bacillus come, we are still in the early stage of our knowledge—there are strong reasons for believing, for example, that the peripheral nerves (lymphatic channels) furnish ways for the reception and passage of the bacillus, but the bacilli have not yet been demonstrated except in nerves of the second rank. And to this point, as well as to others, we must look for the solution as the science of microbiology advances.

F. The viscera.—Although the leprosy bacillus has its essential seat in the skin, the glands, and the nerves, it also attacks the viscera, less frequently than the tubercle bacillus does, but as certainly, the affections being less characteristic of the disease than in tubercle, and associated always with some form or other of leprosy. A true but exaggerated distinction has been drawn between these two diseases, for although tubercle never fails to attack the nervous centres, it is much more common in the skin than is generally thought. It is likewise true that a large number of the visceral lesions found by Danielssen and Beek in their *post-mortems* were of a tuberculous nature or were amyloid or lardaceous degenerations, such as are met with in all hectic fevers; but we have been backward in admitting, or at least too ready in denying, the existence of visceral lesions in leprosy. I confine myself to merely drawing attention to

this circumstance, for to enter into a full examination of it would occupy too much time; it suffices me to say that, having notified the existence in the viscera of bacillary leprosy, that is, of leprotic lesions of the lungs, the liver, the spleen, and the digestive tract, the female generative apparatus never suffers, whereas among men the parenchyma of the testicle is generally affected; and this takes place during the early years of the malady, when the seminal ducts contain the bacilli either in a free state or deposited within the tissues. Cornil, Neisser, and others have authoritatively established this fact.

Here, then, is a definite fact, established beyond doubt, leprosy is a germ disease, a bacillary disorder; its bacilli are not of an indefinite type, but are specific, exclusive, and constant. The bacillus is found only in definite chosen situations in the body of lepers throughout the various liquids and solids, thereby furnishing further affirmation of its individuality.

In every leprosy lesion not in a state of gangrene, both in life and after death, the bacillus can be found, and it is to be found sometimes in situations where there are no other indications of disease, it being in itself the first symptom of leprotic change; it is never found in any but leprosy conditions or in morbid changes that are not of a leprosy nature, that is to say, Hansen's bacillus is as closely indicative of leprosy as Koch's bacillus is of tubercle.

I do not think that any one can suppose this bacillus can originate spontaneously, or that its presence in leprosy lesions, and exclusively in these, is a matter of accident, and further, bacteria apart, that a malady of so specific a nature can be developed without a specific cause.

Is it not in the present day, when medical science, encouraged by the work of the illustrious Pasteur, is nobly striving to free itself from the errors involved in the belief in spontaneous morbid processes, a truly fatal medical error that these and similar paradoxes can be held in esteem?

Leprosy is no exception to the law which denies spontaneous generation: it cannot create itself, and leprosy is no more spontaneous than small-pox or syphilis.

We search in vain for its cause outside the body, and it is due to an error in diagnosis or to an imperfect enquiry when from our observations we apply to leprosy the term "nostras." Besides these cases of leprosy nostras are so few in number, that bringing them forward no more proves the spontaneous origin of leprosy than the many cases of small-pox, syphilis, and tuberculosis in which the cause cannot be traced proves the spontaneous origin of these diseases. Thus, then, leprosy is obviously a specific disease; it represents a perfected type of a bacillary disease of slow growth; and if it can be shown that the disease can exist apart from the bacillus of Hansen, or the bacillus without the disease, it will destroy at one blow the history of bacterial diseases.

II.—On the origin and means of propagation of Leprosy.

The question of the modes of origin and spread of leprosy is one of the most serious and urgent questions that medicine is called upon to settle at the present time—indeed the present multiplication of centres of leprosy among neighbouring countries, the development of the colonial policy of France, and the increasing facilities of international communications give this question a particular and immediate interest, such as it has not possessed at any former period.

There is not at the present time in Paris a single specialist in skin diseases who has not a clientèle of leprosy patients, and who, in addition, does not every year meet with a greater or less number of new cases of leprosy—Europeans who have contracted the disease in leprosy countries, or inhabitants of these countries endeavouring to get rid of the diseases acquired at their place of birth by a change of climate.

Year by year soldiers, commercial men, and the religious working in hospitals, return to France with the disease, and in Paris, at the Hospital St. Louis, lepers from all parts of the world find a permanent home. Not long ago M. Vidal took a soldier into his service who had contracted leprosy at Cayenne, at a time when I was receiving into mine a sailor returned from Madagascar.

In the summer months of the present year, among my new series of cases there was a sister of the order of St. Vincent de Paul who had come home from the Hospital at Rio-de-Janeiro, sent to me by Dr. Brochin Junior; she is affected with the most terrible and cruel form of leprosy that it is possible to meet with; also a jockey whose birthplace is St. Crux, sent to me by M. Dujardin Beaumetz; he had contracted leprosy in the province of Valencia; a French servant from the Consulate of Rio-de-Janeiro, sent by M. Siehel; a young Frenchman born at Port-au-Prince, of French parents who had been resident in the country several years, but who had not themselves any trace of leprosy; and an Italian merchant back from Buenos-Ayres, who was brought to me by his own brother, a doctor.

Similar experiences have occurred in the practice of my colleagues at the St. Louis Hos-

pital, and in that of several hydropathic doctors notably at Bagnères-de-Luchon, Uriage, la Bourboule, &c.

It is, gentlemen, not only from a humanitarian point of view that I again call the attention of the Society to this atrocious malady, the treatment of which is so very indefinite, it is also in the direct interests of our fellow-countrymen, and to obtain for them the solicitude of the Officers of Health of our country.

It is easy to see from what has already been said that leprosy has not a multiplicity of origin; it is acquired exclusively from lepers, just as syphilis is acquired exclusively from the syphilitic; no matter what the circumstances, lepers can contaminate those who live with them, and, under certain favouring conditions of a hygienic and social nature, all powerful in themselves, lepers can import leprosy into any country.

Certain climates, certain races, certain regions are more favourable than others to the development of the agent of leprosy; on the other hand, some are more or less refractory to it, as is the case with regard to a great number of maladies; but no race, no country, and no individual enjoys absolute immunity.

In leprosy countries, the cause of leprosy is not the soil as in malaria, nor the water as in a series of infectious diseases, nor bad food or poverty as in lathyrism or pellagra, &c.; it is the leper himself. Although there may be no inhabitants in a malarial country, or in a cholera country, yet, in their respective localities, malarial fever and cholera may be contracted, but in regions abandoned by lepers, leprosy cannot be acquired.

When any country gets rid of its lepers, or when they are segregated, or kept apart, or are dead, the danger ceases. But, be you who you may, if you go and live where lepers are constantly to be found, although you do not mix to any extent with them, you are liable to get the disease and to get it before any great length of time. If, as has been done by Lutz, an enumeration is made of the lepers found in a leprosy country, it is observed that strangers are, in proportion to their numbers, afflicted to an equal degree with the indigenous population, and in that part of Brazil where Lutz's enquiry was conducted, he gave the number of German subjects who were known by him to have leprosy. Whatever the nationality of the various inhabitants, it will be found they all suffer equally in relation to their numbers; thus, of 652 lepers collected on the 1st April 1886 at Molokai, it transpired that 19 were half bloods, 19 Chinese, and 7 white foreigners of different nationalities.

I fear to weary you in continuing to lay stress on the importance of the fact that leprosy exists only among leprosy people, and that wherever lepers are, under certain conditions, gathered together for the term of their lives, among them leprosy is to be contracted, and it is not to be contracted except in association with them; but I consider it an absolute duty to let there be no ambiguity on this matter, and to declare with a loud voice that leprosy is a transmissible disease, to be acquired only in one way, and that is from people already afflicted with it.

It is carried about by, and follows the movements of, mankind; the history of the malady, its vicissitudes, and its precise habitat in many countries, which can be definitely drawn on the map, place this fact beyond dispute. From India to Egypt, from Egypt to Greece into Italy and the rest of Europe—its halting places, from the earliest times, can be pointed out; in the middle ages, lost sight of among Christian nations, the disease reappeared with the return of the Crusaders; it has become again extinguished by isolation and the lapse of time, except in certain definite and well-known localities.

In modern, in short in contemporary time, it has been carried from Europe to America, to the Southern States at first, where it appeared among the Portuguese colonists, Portugal being a permanent centre of leprosy; and then to the Northern States, owing to the arrival of Scandinavian emigrants and hordes of Chinese.

And to-day, at the close of the nineteenth century, it is, under the influence of improved hygiene and ways of living, slowly but surely disappearing from Scandinavia: it exists in Middle Europe and the East, where long-standing centres of leprosy are awakened into activity by fresh importations of the disease; many countries beyond the seas have their active centres of it, while Asia continues, as in times gone by, to maintain foci of it which are practically inexhaustible.

Leprosy is not, as many men imagine, merely an historical malady of no present and actual interest; it is, on the contrary, a disease that is always with us, always breaking out afresh, and a never-ceasing menace to those who dwell among lepers. It is to the advantage of all of us to be acquainted with the manner in which it spreads and is transmitted. Can it gain access in an indirect way into the system under the influence of the air, soil, water, or food? Is it contracted by contagion so called, that is, by actual association with lepers? And, lastly, can it be hereditarily transmitted?

Here are the answers to these questions.

III.—Of the external origin, and of the indirect or infectious transmission of Leprosy.

The theory that leprosy is a malady originating from causes external to the body is not new, and it was all the more reasonable to hold this view because the disease was always proved to find victims among people living under conditions unfavourable to health. From this circumstance every defective hygienic factor, and particularly those connected with food, has been, at some time or other, credited with causing it; but repeated accusations of this kind have had to be abandoned and the view adopted that the morbid states induced by insanitary surroundings and improper food merely pave the way. Indeed it must not be overlooked that there are large numbers of lepers who have never been exposed to these conditions which are said to engender leprosy, while there are whole populations who have been subject to the conditions and who have always been free from leprosy. This point is therefore set at rest. But with the discovery of the leprosy bacillus a reconsideration of the question was suggested, as the bacillus might possibly exist in the soil, the air, or water, or in food. It became no longer advantageous to know that dirty water had been drunk, or decomposed fish, or impure food, or cereals damaged by salt water had been partaken of—but rather whether this water, these various impure foods, by reason of a leprosy soil and atmosphere, actually contained the specific bacillus.

Assuredly this was a question of the first importance—a necessary preliminary research which had to be taken in hand with care and without delay.

But what is the case? Neither Hansen nor any one else in Scandinavia undertook this enquiry, nor have any of the leading laboratories in Europe, where questions of this nature are eagerly studied, not even the laboratory at Berlin, instituted any enquiry in this direction. Of this I have taken pains to assure myself.

One author only, Arning, a German doctor, who had studied leprosy in the Hawaiian islands with great skill and judgment, has investigated the question under very favourable conditions in leprosy countries, in a region where the materies morbi of leprosy is in full development: with this object he examined the air, the water, and the food; and the results of his repeated examinations have been negative. It does not follow, however, that there is nothing more to be said on the subject: it may be held that our knowledge of the natural history of the microphyte of leprosy and of bacteriology is yet too slight; but provisionally these negative results bring us again to the formula I have enunciated, viz., that leprosy is acquired by direct contact with leprosy persons, and that the means of transmission differs, in this respect, from that of cholera, tubercle, and typhoid fever. Quitting these hypothetical and barren sources, I hasten to examine independently the agent of transmission, to enquire under what conditions the contamination is effected, and the manner in which it may best be studied.

IV.—On the direct communication of Leprosy from leprosy to healthy men, or of the contagiousness of Leprosy.

In olden times, in the middle ages, indeed up to quite a recent period, the danger to healthy men of associating with lepers was never disputed; but at the commencement of the present century doubt was thrown on the contagiousness of leprosy in consequence of the surrender of the notion that diseases were of a specific nature, and of the consideration in connexion with leprosy of negative facts relating to it; and thus minds were prepared to accept without opposition, and without criticism, the views of the Scandinavian anti-contagionists—Danielssen and Boeck—supported as they were later on by the authority and prestige of the name of Virchow. But while this new doctrine that leprosy was not contagious was spreading with a rapidity peculiar to great errors, one saw clearly produced towards the middle of this century, as a consequence of emigration, a series of absolutely new leprosy centres, and a renewed activity in old ones, and this in a very rapid manner.

From this period a re-action has been progressively taking place, the exact date of the beginning of which being quite thirty years ago, is well in advance of any knowledge of microbes, and it cannot therefore be in any way connected with bacteriology.

Its origin was largely due to facts observed in Madagascar, the Sandwich Islands, and many other countries to which lepers from Norway, China, and other leprosy centres emigrated; and, lastly, to facts observed in our own time in neighbouring countries to our own.

In observing that leprosy increases or decreases in proportion as isolation is neglected or enforced; in noticing that emigrants who are lepers create new centres of leprosy in the countries to which they emigrate, or give fresh activity to, or create again, leprosy in old

centres where it had become extinct; in studying more closely the facts in connexion with heredity and interpreting them scientifically, it is impossible to do otherwise than return to the traditional belief that leprosy is contagious.

If I were from among really competent authors to give the names of those who are contagionists,—if I were from among physicians who are reported anti-contagionists to give the names of those who treat the disease as if it were contagious, i.e., who believe in and practise isolation,—I could lay before you a majority such as would be equivalent to a complete unanimity of practice if not of belief. While paying due regard, in the interpretation of facts, to those who have discovered them, there is no great advantage in a question of this nature to advance names in support of one or the other theory; but I cannot, however, overlook the necessity of correcting some statements made by my learned colleague and friend M. Constantin Paul, in his very remarkable report of July 1885.

They are to this end—that the English investigators, Fox and Farquhar, who conducted an enquiry on leprosy in India, come to the formal conclusion that leprosy was non-contagious. If my honourable friend, and colleague will, as I have done, take the trouble to read that portion of the English report on Dermatology which relates to this question, he will see that Fox no more than Farquhar has denied the transmissibility of the disease from a leper to a healthy man, while he fully admits that the disease can be introduced into a new country by immigrant lepers.

The opinion of the day in England is that the disease is contagious, and in Scandinavia this opinion has so far progressed that one must erase from the list of non-contagionists cited two years ago by M. Constantin Paul the names of Hansen, Sand, Caesar-Bœck, and Kaurin. I will not dwell upon this point, but having drawn attention to the growth of the belief in contagion, and pointed out what little weight should be attached in a discussion of this nature to a marshalling of names, I now return to a direct examination of the subject before us, viz., the question of the contagiousness of leprosy.

If one wishes to address himself to the real question of the probable mode of transmission of leprosy, he will do well not to dwell upon the causes of violent contagious diseases such as small-pox, where the symptoms are well marked and follow one another with rapidity, or such as syphilis, wherein there is first a lesion, a relatively short stage of incubation and abundant secondary symptoms; but he should address himself to the occult contagiousness of lingering diseases with practically unlimited periods of incubation and of erratic course, such as tubercle. Given suitable conditions, leprosy is quite as contagious and prolific as tubercle: no matter with what profusion the germs of these maladies are sown and disseminated, they will not, unless the conditions of health are imperfect, develop, and in the case of leprosy the disease takes root only where all these conditions co-exist. Among the conditions with which we are acquainted we must place foremost, individual and social defects, filthy and miserable dwellings, and overcrowding of human beings.

It is for this reason that in countries of old standing and an advanced state of civilization, and wherein there are sanitary boards and officers of health, leprosy does not take root; the disease spreads only to such as live in immediate contact with the leprosy, and the contagiousness of it is so much lessened that it is exceptional for it to spread at all.

This contagiousness, however, is sometimes exercised, as I have pointed out, no matter what the conditions are, as was proved by the careful case brought forward by M. Vidal in the course of the discussion in 1885, but which it will serve no purpose to reproduce here.

In 1872 Dr. Hawtrey Benson exhibited before the Medical Society of Dublin an Irishman with leprosy contracted in India, where the man had for 22 years been living. For a year and half the brother of this man, who had never quitted Ireland except on a visit to England 46 years previously, but who slept with the leper and wore his clothes, became leprosy, and was shown before the same Society. There were no other lepers in the family, and there had been no leprosy in the British Isles for many past generations.*

Such clearly-observed facts are not frequently made outside leprosy countries because the conditions wherein they are to be found are themselves very exceptional; but where they are established with such apparent precision, and on such good authority, I would ask how it is they can be misconstrued; and all the more so, because that which is rare in non-leprosy countries is of every-day occurrence in leprosy ones. The most recent published statement that I can acquaint you with is by Dr. Kaurin of Molde, who up to that time was in doubt as to the contagiousness of leprosy, and who has written: "The longer I study leprosy, and the more I see of it, the more convinced do I become that this disease is transmissible from one person to another." This observation had reference to the case of a child whose parents and grand-parents were quite free from leprosy, and who had four brothers or sisters. Among the five children he was the favourite of a great uncle who was a leper, and he frequently

* I suppose the author means there had been no leprosy centre.—Trans.

slept in his uncle's bed, whereas his brothers and sisters never did. This child, and he alone, was attacked with leprosy, the first marks of the disease appearing on his hips. Can there be any doubt as to the cause in this case, *i.e.*, whether it was due to a one-sided hereditary tendency handed down by an ancestor of the third generation, or whether it was the result of sleeping in the same bed with an unfortunate leper covered with ulcers—in a bed made of rotten straw, and, in place of bed linen, filthy pillow-covers, dirty under-clothing, and old rags unfit for use during the day? In this case there were just those conditions of promiscuous herding which are found in China and Japan, in Oceania, such as we see too in Scandinavia, and which all authors, notably M. Leloir, have more than sufficiently shown lead to the formation of leprosy centres in all parts of the world wherever hygiene is disregarded.

And now passing from isolated facts to the experience of the many, if we study the development in our own time of new centres of leprosy in Europe and beyond the seas, we see as clearly as possible that the malady spreads from individuals who are actually suffering from it to those who are in health; as, for instance, during the epidemic in the province of Alicante, of Cape Breton, of Louisiana, &c., and, lastly, in that most memorable epidemic of the Sandwich Islands which occurred at the same time as that in the province of Alicante, and like that epidemic was developed under the eyes of the present generation with features of such rapidity and intensity as to place the causes beyond all doubt. The most important facts in connection with the epidemic were brought before you by my learned colleague and friend M. Vidal in the discussion in 1885, and they have been made skilful use of again since then by his distinguished pupil M. Brocq, and lastly by M. Leloir.

One point alone has been disputed, and on that a very keen controversy took place between our two colleagues, M. Le Roy de Mericourt and M. Vidal. The point in question is whether lepers existed or not in the islands before the outbreak of this severe contemporary epidemic. M. Vidal, contagionist, maintains and brings forward many reliable data in support of his views, that leprosy was unknown in the islands before the arrival of the Chinese.

M. Le Roy de Mericourt, who does not, I believe, deny the importation, but who is an anti-contagionist, affirms that leprosy was known in the islands before the arrival of the Chinese, because his old master Dr. Quoy seems to have noted the existence of the disease there among the indigenous population in 1819, when the French Corvette Urania visited the Archipelago.

Unfortunately for the latter opinion, as has been very justly pointed out by M. Vidal, and as nearly all dermatologists hold, the descriptions of the disease given by Dr. Quoy are altogether insufficient to satisfy the medical mind that it was really leprosy he had seen.

But having said this much, I hasten to add that, admitting the observer has given us an inadequate description, it does not follow that leprosy did not exist, or that he did not see cases of leprosy.

To me it creates no difficulty, and I will willingly allow M. Le Roy de Mericourt's contention that leprosy prevailed in the islands anteriorly to the arrival of the emigrants.

But, differing from my colleagues, I confine myself to what is really the point at issue, that is, to determine whether the epidemic in question did or did not owe its existence to the arrival of the Chinese. The question which they discussed is of trivial importance, for admitting the correctness of both views does not invalidate either of them; and if we allow it has been proved to satisfaction that leprosy prevailed in the islands in past times, it will not prove that the severe epidemic in question was not due to the importation of a new supply of germs.

Indeed the history of epidemics clearly proves that the fresh importation of a disease to a centre where the disease newly imported is latent, is much the same in its consequences as if the disease were still prevailing in that locality, or as if it were endemic; and the arrival in the Sandwich Islands of emigrants suffering from leprosy was quite likely to give rise to a fresh epidemic, even allowing that leprosy had previously existed in the islands.

At the present time, or in the past, the existence of cholera, small-pox, plague, &c., in any locality, has never been an obstacle to the importation of new germs, whereby the disease has become more severe—a true activity due to a renewal of germs. All maladies, even the most contagious, are subject to extreme variations of transmissibility, in different countries and among different races; and even in the same countries, and among the same races, at different epochs. I have applied myself for many years past to the investigation of such matters for the Paris Epidemiological Society, showing, for example, that, under a continuance of the same conditions, small-pox is alternately active and latent; and that scarletina is always at Paris relatively inactive, although in London it exhibits extreme virulence. Whenever the diseases I have referred to are under consideration, maladies acute in their course and maddening in their outbursts, these fluctuations are clearly apparent, and the source of the new importation is easily recognised as effects quickly follow causes, and the producing agents of the malady being still in operation, or even present, when the spreading disease declares itself.

But in the case of leprosy, where the progress is so slow that many years intervene

between the first symptoms of the disease set up by the importation and the deaths, the question becomes, on the contrary, a complicated and difficult one.

On the other hand, old diseases, such as leprosy, are subject to periods of partial effacement of such duration and degree that the malady becomes rare, modified, more or less innocuous, and ceases to be recognised.

It was in presence of an experience of this kind that the return of the Crusaders to Europe gave rise to a severe epidemic of leprosy throughout Christendom, at a time when the disease seemed to be disappearing from Central Europe. The case is exactly the same with regard to the Sandwich Islands, where they had very likely had leprosy in past times, but where at the time of the arrival of the Chinese the disease had become so rare that the European doctors practising there did not know of its existence.

Such was probably the case, too, in regard to syphilis in Europe, for the severe epidemic of the 15th century broke out at the time when there was a large influx of people from beyond the seas; and it is, I think, with this explanation that the views of the partisans of the ancient and modern origin of syphilis can be reconciled.

As to the actual fact of the contagiousness of leprosy, many observers have been profoundly impressed by the numerous instances wherein the disease has not spread from diseased to healthy individuals, in spite of personal contact as thorough and complete as could be imagined; and although the same negative results are witnessed in other diseases, notably tubercle, still these instances have led observers to overlook or disregard facts positively indicative of contagion, and to deny the contagiousness of leprosy from a consideration of negative facts only. It is now necessary to enter upon an examination of this question.

I propose from the first to ignore altogether the negative results, and for two reasons: one is because it is possible for a malady to be contagious without every one being attacked and killed by it, and the other is because they cannot invalidate the facts which point positively to its transmissibility.

Nevertheless, as several of my learned colleagues in this academy continue in an uncertain mind or are decidedly opposed to contagion, I must neglect nothing that may in any degree serve to assist them in judging the question, or to bring them to the view that I take to be the true one.

At the outset I would note, with a view to paving the way to a clear understanding of the contagiousness of leprosy, that with regard to many transmissible diseases the mode of contagion, far from being unique and unequivocal, is, on the contrary, of a very indefinite and open nature, and distinguishes them in a marked manner from that small number of diseases which are so clearly and invariably contagious as syphilis or small-pox. There is a series of diseases of a very dissimilar type—typhoid fever, tubercle, erysipelas, &c.—of which the contagiousness to-day certain, was for a long time ignored or disputed, and is so still, perhaps, for the simple reason that they do not fall within the rudimentary scope of old established laws on contagion.

In reality leprosy, as well as tubercle, is or is not contagious according to certain conditions: some of these conditions we are acquainted with, but of the others we are ignorant; in both diseases the contagiousness is sometimes deplorably active, while at others it is uncertain, doubtful, or absent. This knowledge does not upset our belief in the contagiousness of tubercle; why should it then do so of leprosy?

The arguments which have been used in favour of the non-contagiousness of leprosy are replete with the nosological errors to which I have just drawn attention.

Although these are numerous and varied, they may, with advantage to the discussion, be tabulated under five heads:—

- I.—Leprosy has never been transmitted to animals.
- II.—The inoculations practised on man have been unsuccessful.
- III.—Healthy people often live with the leprosy without getting diseased.
- IV.—Doctors, nurses, &c., do not contract the disease from nursing the sick.
- V.—Lepers brought to thickly populated centres such as Paris, the St. Louis Hospital in particular, have never transmitted leprosy, nor created new centres of the disease.

I purposely omit questions involved in heredity: this matter will be discussed, presently, in another place.

1st Objection.—That leprosy has never been transmitted to animals. This is true: leprosy does not attack animals; if the disease had a reaction on animals, as tuberculosis has, we should not be discussing its contagiousness; but we should clearly bear in mind that syphilis is not communicable to animals, and this statement alone suffices to remove the objections. To the cultivation and development of the majority of the pathogenic germs man offers favourable

media, a circumstance to which sufficient attention has not yet been given; it is not the same with animals, who are quite refractory to a series of human maladies, which produce in them merely toxic or septic, and not virulent effects.

If syphilis and leprosy were communicable to animals, such transmission would have taken place many centuries ago. Animals are inoculable only with the maladies to which they are subject, tuberculosis for example, from which they have suffered in all times; and in my opinion all the experimental inoculations of animals with syphilis and leprosy are valueless.

2nd Objection.—The inoculations practised on man have been unproductive. By absolute right this objection can with equal justice be set aside; on the one hand because the non-inoculability, or better the inoculations made without success, of any disease have never convinced us, *ipso facto*, that it is non-contagious. Inoculability is indeed but one of the phases of contagion; many affections considered contagious do not possess it; there is no occasion for me to point out that among them are diphtheria, cholera, typhoid fever, scarlet fever, &c. On the other hand, technical bacteriology has not advanced sufficiently for us to declare that a disease is non-contagious because we are unable to transmit it by inoculation. I want no other proof than that of scrofulo-tubercle, which I, from bed-side observation, held to be contagious at a time when the experimenters denied its inoculability: they have now learnt how to inoculate the disease and they deny no longer.

I cannot too strongly urge medical men who would form a decided opinion on this point not to arrive at it without subjecting their objections to thorough examination, and to distrust their power of judgment, if they have not made bacteriology a study, or have not learnt how varied the practice of this science is, according to the species of germ experimented with.

I would add that the experience must be extremely varied to enable us to collect the inoculation material at all stages of the disease. One should not forget that syphilis, the most readily inoculable of all diseases, loses in the course of several years its power of transmission, even in respect of its essential features; and it is the same, most probably, in regard to leprosy. But, as leprosy is not transmissible to animals, it is obvious that repeated experiments cannot be made on man as they can on the lower animals in the case of other diseases.

Moreover, unless under certain exceptional circumstances, to which I will refer, such experimentation constitutes a truly criminal act and no medical man has a right to continue it.

However, it has been repeatedly tried during the present century, happily without effect. All such experiments undertaken prior to the discovery of the bacillus, and made by medical men having no notion of the difficulties of the question, are worthless. I could also show how fallacious their negative results were, but it would, for the illustration, be necessary to advert to names already compromised, and open without advantage an acrimonious discussion: ample illustration however, both convenient and judicious, can be found in M. Leloir's treatise. A solitary experiment, sanctioned and scientifically conducted, was undertaken in the Hawaii Islands on the 30th September 1884, on the body of a murderer condemned to death, but reprieved on the understanding that he consented in writing to submit to inoculation. The experimenter was Arning. Fourteen months after the inoculation no symptom of leprosy had manifested itself. Up to the month of March 1885, whenever Arning explored the site of the inoculation, he found bacilli, their number progressively diminished, but they were nevertheless present in the last shred of tissue excised at the end of 14 months. So that the experiment was not a completed, or was only a provisionally negative one. In order that every one may clearly appreciate its value, I give the original report, word for word, and in the English language, in which it was drawn up: one will see in addition, developed and discussed an incident relating to the interpretation to be given to wounds which doctors may inflict on themselves at the autopsies of lepers—an incident which solves one of the disputed questions of which I shall speak presently, and which also shows that the question of the contagiousness or non-contagiousness of leprosy is capable of exciting medical men to such a degree as to suffer them sometimes to forget the spirit in which scientific discussion should be conducted.

Arning's report: "I have hinted at similar ideas in the motives accompanying my application to His Majesty's Privy Council, to be allowed to perform some inoculation experiments on the condemned convict Keanu. The application I made resulted in the sentence of death passed on the murderer being commuted to penal servitude for life. With the prisoner's written permission I commenced operations on the last day of September 1884, after having previously made a most searching enquiry as to any leprosy taint in his family and a close examination of his own body. This examination satisfied me that, as far as I am able to judge, no trace of the disease could be found in him at that time. A further step was to insure that the prisoner would not be employed at work outside the prison walls.

"As stated above, I inoculated Keanu on the 30th September 1884, and for the four weeks following I saw him daily, and after that for once a week for several months, a microscopic examination of the inoculation spot being made every time. After that period, the convict has been examined by me regularly once or twice a month. The microscope revealed the pre-

sence of the *bacillus lepræ* in large numbers until the middle of March 1885. They have since gradually diminished in number, but the recent excision of a small part of the scar shows them present even yet, *i.e.*, nearly 14 months after inoculation.

"At the same time there is nothing in the general appearance of the convict which would denote any development of leprosy. Pains in the joints of the inoculated arm, from which Keanu suffered in January and February last, have since disappeared.

"To the foregoing I wish to add the following remarks:—

- (1) I do not consider my experiment with Keanu concluded, or mature for scientific publication.
- (2) Even if future observation should show us no trace of leprosy developing, we would not be able to infer more from the experiment than that in this case inoculation proved ineffectual.
- (3) I have given this account of the experiment to Your Excellency (the President of the Board of Health) and the members of the Board, to allow you to judge of the spirit in which it is being conducted.
- (4) Moreover, I have been induced to do so by recent perfectly unauthorized publications of Dr. Fitch, in a Californian Medical Journal, as a protest against the thoroughly unprofessional conduct with which this author, who could only gain knowledge of my doings in an under-hand manner, has brought my name and work forward in support of his unproven assertions. I take the same opportunity to protest against the narrow arguments used by the same author, as far as this subject of inoculation goes. He cites my name and an ordinary *post-mortem* blood poisoning, which I acquired at the autopsy of a leper, as a proof of the non-possibility of the inoculation of leprosy. It would be a very bad thing, indeed, if all the cases of common local and general septic poisoning, at a *post-mortem*, should result in our acquiring the disease the patient was subject to. Vague statements of this nature do not deserve, and would not find, an answer from me in a scientific publication, but as they are put forward with the intention of captivating the mind of the general public, and are, as bold and positive assertions, more apt to do so than the restricted and guarded utterances of calm independent observation, I have given them this brief consideration in my report.*

But, gentlemen, if the experimental inoculation of leprosy is yet in its infancy, it is much to be feared that from clinical observations we shall very shortly be in a position to certainly show, by only too conclusive proof, that leprosy is inoculable.

I have already emphasized that well-sustained objections had been raised to compulsory vaccination being extended to a leprosy country, since it was the cause of the spread and rapid dissemination of leprosy among the population, and also because it was noticed that leprosy centres coincided with vaccination centres. I have to add that Arning has discovered the leprosy bacillus in vaccine lymph taken from lepers; and here are two cases of leprosy transmitted by vaccination, observed and published this year by an accomplished observer (see 'B. M. Journal,' 11th June 1877), Dr. W. T. Gairdner, Professor of Pathology at the Glasgow University. I give them in their entirety:—

"Six or seven years ago the parents of a young child who was apparently in good health but suffering from a well-marked cutaneous affection, went to consult Dr. Gairdner, Professor of Medicine at the Glasgow University, and handed him a letter from a medical man who had lost his sight but who explained that he had been a pupil of Dr. Gairdner's some 20 years ago. Dr. Gairdner held a consultation with his colleague Dr. McCall Anderson, and both of them concurred, without the least hesitation, that the child was suffering from the early stage of leprosy. The author was particularly struck by the fact that the doctor of the country whence the afflicted child came had not given a clear and precise diagnosis, and had not warned the parents regarding the nature of the disease from which the child was suffering, although he was practising in a tropical island where leprosy was endemic, and was perfectly familiar with the disease. The father and mother of the child were of Scottish descent, both of them were in the best of health, and their remaining children were in the full enjoyment of excellent health.

"Three years later, having occasion to give some lectures on leprosy, he made enquiries to discover the whereabouts of the little sufferer. The child was at this time with his family at Helensburgh, where he was being attended by Drs. Reid and Sewell; his condition was greatly aggravated, he was very weak, covered with ulcerations, and in a deplorably emaciated state. Dr. Gairdner went to see him, and found him in the last stage of the disease, suffering from crippled extremities, and ulcerations of the skin, and probably serious visceral lesions. It was during this visit that he learnt the cause of the singular reticence of Dr. X, who had attended the child in the tropics. The father of the child, a ship's captain, who made repeated voyages between Scotland

* Since the publication of M. Besnier's paper a certificate has been received from Her Britannic Majesty's Consul-General in Honolulu, bearing the signature of N. B. Emerson, President of the Board of Health, and dated the 25th of September 1888, stating that Keanu has become a tubercular leper. The certificate in question appeared in the London 'Times' of the 10th of the following November. There is no reason to doubt that the disease in Keanu results from the inoculation performed by Dr. Arning.—*Trans.*

and the island in question, had elicited the confession from Dr. X. that the reason he had not, at an earlier period, informed him of the nature of the malady was because he did not wish to compromise his own child, who, he believed, was suffering from leprosy, and through whom the captain's child had become infected. He had, in short, vaccinated his own child with virus taken from an infant belonging to a family of lepers, on whom the disease had not declared itself; subsequently he vaccinated with the lymph taken from his own son, the captain's child. In due course both his own child and the captain's were attacked with leprosy, but, since his own son only suffered in a mild degree, he did not hesitate to do all in his power to conceal from him the existence of the disease. Meanwhile Dr. X. died and his son, entrusted to guardians, was placed in a Scotch school with which Dr. Gairdner was well acquainted. After much hesitation arising from professional regard, for neither the doctor's child nor any of his associates were aware that he was suffering from leprosy, and by reason of the serious nature of the disclosure, he decided on making a confidential enquiry, when he learnt from the medical man attached to the establishment that X.'s son was undoubtedly suffering from leprosy.

"The captain's child quickly succumbed to the disease. Shortly after, Drs. Gairdner and McCall Anderson together examined the doctor's child, and they proved that the disease with which he was afflicted was evidently leprosy of a benign nature, but characterized by spots, cicatrices, and large areas of anæsthesia on the dorsal surface of one of the limbs."

Except for one point still under enquiry (which is an uncertainty whether one of the vaccinifers was afflicted with leprosy), it is difficult to find stronger evidence in support of the views which have been maintained in France, for the past two years by myself, with ability and judgment by my colleague and friend M. Vidal, and after him by his distinguished pupil Brocq.

I hardly dare to hope that the recital of these careful observations will convert every dissentient among us; but I am convinced it will strengthen my position with the more critical of my colleagues, and make them allow that the contagiousness of leprosy has now entered a phase admitting of scientific discussion, and that it will render opposition less irreconcilable.

3rd Objection.—A married couple often live together for several years, one being and the other continuing healthy. That is true, and it is one of the circumstances which have largely contributed to diffuse the opinion that leprosy is not contagious; but, at the same time, it affords the clearest and most striking evidence of the contingency of leprosy contagion, which, because it does not come into force, must not therefore be overlooked.

The question is much more complex than is believed. Presently, in the matter of leprosy, I shall show that a woman may give birth to a leper and enjoy an apparent immunity of nature of that which obtains in syphilis under the name of Colles' law; on the other hand, it should be clearly borne in mind that the same objection would appear opposed to the contagiousness of tubercle, and that is sufficient to deprive it of any real value. Indeed this immunity is far from being of invariable occurrence; one is acquainted with the recent observations relating to contagion from conjugal relationship: M. Vidal has quoted authorities, and M. Leloir, after having pointed out the sources whence information may be collected, has reported three fresh observations by himself on this point, which would serve of themselves to establish the contagiousness of leprosy.

Observers on the question have, up to the present time, been misled by the systematic value accorded to inherited leprosy. If one makes an enquiry into the subject afresh, with a sufficient knowledge of the elements of the question to be considered, then those facts which are deemed of no moment or rare, will present themselves so frequently as to sway their convictions. Thus we may conclude, from theory and nosology, that this objection is without value.

4th Objection.—Doctors, nurses, &c., do not contract the disease from the sick on whom they attend.

It is a painful task for me to reply to this objection in the presence of the afflicted condition of the unfortunate sisters of charity, and the noble brother Damien, victims to their sublime devotion; and in presence of the observations brought forward by leprosy doctors.

Must we recall that 9 or 10 per cent. of the servants employed in the Leper Hospital at Molokai became leprosy, and that at the beginning of 1884, of 943 lepers 52 were servants of different kinds who had contracted the disease subsequent to their connection with the institution.

The fact of the matter is this, with leprosy, as with many other maladies, the prospect of contagion in the case of doctors, attendants and servants is very remote, under ordinary conditions; and such is the case not only for tubercle which I can appropriately advert to, but also for syphilis.

Look to our large special hospitals in Paris, —le Midi, Louraine, St. Louis; every day we handle, in the literal meaning of the word, the contagious agent of syphilis; and, although syphilis is transmissible in the ordinary way, the conditions necessary to contagion so rarely are fulfilled, that the exceptions, so deplorable in themselves, occur very rarely. For my own part, I have paid attention to this subject at the St. Louis Hospital for more than 15 years, and, within the range of my own observation, not a single case of syphilitic contagion at the hospital has taken place among the doctors, the nurses, the students, or the servants.

After this experience we cannot be surprised why lepers so rarely transmit the disease in a hospital, or in a large town, or why their malady, which is so repulsive that prolonged contact with them is avoided, has not been communicated to others.

5th Objection.—Lepers brought to thickly populated centres, such as Paris, the St. Louis Hospital, have never transmitted leprosy nor created in France new centres of the disease.

It has been brought forward as an argument against the contagiousness of leprosy that the presence of leprosy immigrants in Paris does not lead to the formation of leprosy centres; and to this point attention has very recently been drawn by some who are now present.

It is asked if the lepers we attend in Paris families, in charitable institutions, in our hospitals, have ever transmitted the malady to those about them. No, not that I am aware of, or, to express my opinion more correctly, not yet. The large towns, the large hospitals, and other places that I can point out are not favourable to the multiplication and growth of the leprosy element. Indeed in them the laws of hygiene are carefully heeded, bathing and ablutions are largely practised, medical men exercise frequent supervision of these places, promiscuous practices in living are reduced to a minimum; and all the lepers found here are confirmed lepers and so repulsive that much contact with them is unlikely to take place.

It is precisely the reverse of this in regard to people who live in leprosy countries, and in regard to all the conditions found to exist where centres of leprosy become created. But if you succeed in spreading the dangerous opinion that leprosy is not contagious, and give free pratique everywhere under all conditions, and without exception, to the increasing numbers of lepers coming home from America, where they have acquired the disease, possibly many years may not go by before my prediction comes to pass; and the more likely is this to happen since, thanks to the daily facilities given by maritime intercourse, the unchecked emigration of lepers may introduce, into poverty-stricken and small places, a class of poor lepers who have returned to their country before the disease has become developed.

Put such subjects in some of our wretched fishing villages, where, for example, cholera is known to immediately and invariably take root, and you will surely witness the production, in the lapse of sufficient time, of a centre in our own country. If those who doubt what I will examine the causes of the special epidemic of leprosy in Valencia or Alicante, they will probably think with us that it is advisable to warn medical men charged with the care and protection of our soldiers and sailors who have served in our colonial operations, at the present time, to be very extended, not to misconstrue our advice and to exercise an efficient surveillance.

But, on the other hand, if the immigrant lepers are in a more fortunate and prosperous condition, and if they come to a place where the laws of hygiene are not neglected, the danger to those who have none but ordinary social relations with them is insignificant, and for those who live in close intimacy with them, the danger is almost *nil* provided they observe the most elementary domestic hygiene.

V.—Of the Hereditary Transmission of Leprosy or Congenital Leprosy.

The hereditaryness of leprosy, of which you would imagine one should be able to speak with confidence, has not been studied as fully as the subject deserves; it is accepted on credit in mass, without question, and it is largely employed as a telling argument in favour of anti-contagion; whereas, on the contrary, no argument is better calculated to demonstrate the contagiousness of the malady.

Indeed the belief in the hereditaryness of leprosy is traditional, because it is manifest that children of leprosy parents more frequently become lepers than children born of healthy parents.

All the same the frequency of this occurrence has been exaggerated, and the statistics through which it has come to be accepted are most inconclusive. Provided there is one well-marked leper in an entire family, forthwith the circumstance is recorded as evidence of heredity. But if these researches are gone into more closely, it becomes at once obvious that the actual percentage of hereditary cases of leprosy is, of a certainty, much lower than the authorized figures, which attribute the majority of cases of leprosy to hereditary transmission. Of 107 investigations made with a view of elucidating this question by M. Leloir, he could discover only 47 wherein there were leprosy ancestors, parents or grand-parents,—in 60 observations the ancestors were free from leprosy—so that, while admitting that all those who had leprosy ancestors derived the disease from their ancestors, which is in excess of the truth, one already sees that an hereditary taint was wanting in more than half the cases.

On the other hand, a careful numeration of infants born of leprosy parents is made, it is seen that those who become leprosy are in the minority; even is this so in the leprosy houses.

In 1884, at the time of the visit made by Queen Kapiolani to the leper house in Molokai, Dr. Hutchison drew the attention of the sovereign to the large number of healthy infants,

an extrinsic germ which the progenitors themselves previously acquired from without. It is no longer a question of inheritance in the old sense, of simple inheritance, either a true inheritance or a defective formation of the initial cells; it is, in the clearest way, a transmission, implantation and inoculation of the agent of contagion under an essential condition, that of heredo-contagion.

Such is the case for leprosy and virulent diseases, which can be contracted after, as well as before, birth, and which are not any more hereditary in the old sense of the word than is small-pox when contracted by the fœtus in the womb—without exception they are the result of the unaltered transmission, from the generators of the product, of a specific extrinsic element, introduced by the seminal channels, or more probably by the placental circulation: applied to leprosy this doctrine of transmissibility clearly demonstrates that, far from being opposed to one another, the views on the inheritance and the contagiousness of leprosy, on the contrary, confirm each other, and by demonstrating one we prove the other.

Arrived, gentlemen, at the end of this lengthy exposition, I repeat in a few words the main conclusions to be got from it, not for the sake of drawing up succinctly-worded contentions, but so that what I have attempted to express shall be quite free from ambiguity, and serve as the basis for future discussion on the subject.

Far from being an extinct disease, leprosy holds, on the contrary, a prominent place in general and international epidermiology, and has for this country a direct interest. It is neither a self-generating disease, nor a malady resulting from accident or poison.

It is an extremely common human disease of a specific nature, with a definite bacterial element.

It is as yet undetermined in what stage the microphyte is when operating as the medium of contagion, but the existence of microphytes in every leprosy lesion on the one hand, and the transmissibility of leprosy on the other, are two facts that can be considered separately. This transmissibility is exercised in a very varied way, and under conditions of which some are disclosed to us, but of the majority of which we are ignorant: man seems to be the sole agent or at least the essential agent inevitable to this transmission.

It is almost certain that it can be inoculated during vaccination for instance. It is certain it is carried by man, from one place to another, attached to man and not to the soil: it is certain it can be congenitally acquired, but this danger is infinitely smaller than is even now believed, and we can to-day protest with a loud voice against the hitherto received doctrine that makes leprosy an inevitable birthright of the leper's progeny.

The extrinsic conditions, such as social misery, filthy promiscuous living, favour in the highest degree the spread of this malady; the inverse conditions, a regular state of life, and the observance of general personal hygiene, almost annihilate its contagious faculty. Thus, better understood and more clearly described, thanks to the works of contemporary physicians, in the front rank of whom is Leloir, thanks to the spread of the teachings of the illustrious Pasteur, leprosy has definitely entered into the scientific period of its history. Meanwhile, in the absence of a knowledge of an efficient therapeutic agent, medicine can oppose to it a certain prophylaxis, based on the progress of hygiene and general sociology, and can take the protective measures necessary under certain known conditions, without having recourse to the cruel practices of a by-gone age, and thus be faithful to the principles of liberty and humanity, which is the greatest glory of our day.