The discussion which followed my last communication and the statement itself were so hurried that I failed to insist on certain aspects which I thought were already known. Then and later, I also realized that for some colleagues the idea of transmission of leprosy by mosquitoes was totally new, although it first came up thirty years ago. I do not claim to have opened a new avenue, nor to have been the very first to bring up this idea, though it is now over a quarter of a century that I first thought of this possibility while observing the facts.1 Being unable to provide positive proof, I did not publish especially on the subject, but mentioned that leprosy as probably belonging to the diseases transmitted by mosquitoes, and requested Prof. Unna to call the attention of leprosy specialists also to this possibility, on my behalf, at an international congress. At that time, unfortunately, the question was completely disregarded by the persons who were most favorably placed for its investigation, and in some places this continues to be so. Besides historic-geographical and statistical studies of interest, but devoid of vital information, the first volumes of Lepra bring only unimportant case-histories. Beginners voice their views on problems which require years of observation and very often conclude in favor of great contagiosity of leprosy because they found two cases in the same family or in the same place, without giving a thought to the numerous and well-known facts which speak against direct contagion. It was only in the last years that experimental pieces of work were undertaken, but their authors generally gave up as soon as they encountered the first difficulties regarding the role of the mosquitoes, without grasping that they are the only insects that can explain the form of propagation of leprosy. For this reason they were led to suggest preferably flies and bedbugs without stopping to ponder that these could not explain the capricious way of propagation. These difficulties were already encountered by Arning and by me, but gradually I found the very probable explanations. The arguments that follow are my own and for this reason my statement was considered subjective. I did not want to repeat arguments and facts which were already known. You cannot acquire knowledge of leprosy and become able to diagnose incipient cases merely by reading the information contained in the French, English, German and Portuguese literature, although it is now much larger than when I began my studies. When one has

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1 Dr. Lutz was one of the first, if not the first. See ‘Mitteilungen über Lepra Nach in Brasilien gemachten Beobachtungen von dr. Adolph Lutz in Limeira, Brasilien’, Monatshette für Praktische Dermatologie, v.6, n.9, 1.5.1887, p.504-20, 546-60, 1887. [Note by B. Lutz]
the opportunity to observe the first symptoms of leprosy and the circumstances under which they occur, one often cannot agree on the generally acceptance of repeated opinions. I have observed, and have published, in part, symptoms which I did not find in the literature and I am quite willing to forego lessons from persons who having read a few articles on leprosy consider themselves qualified to intervene. It is not by quoting facts that have not been tested and that have often been misrepresented, nor by giving the opinions of authors whose work has not been controlled that one can argue on leprosy. Most of the objections presented against the points of view expressed by me can be answered easily.

For instance, the example of the island of Maré was brought up as having no mosquitoes but having many lepers. Now, Leboeuf only refers to the absence of Simulidae (black-flies, which are also absent from Hawaii), when he says textually: “L'exemple de l'île de Maré du groupe des Loyalty suffit à le démontrer amplement. C'est en effet un bloc de corail mort, ou il n'existe aucune rivière, aucun ruisseau, pas la moindre trace d'eau couante. Les simulies y sont inconnues. Or la proportion des lépreux y oscillait en 1912 entre 4 et 5%”. There is not one word here on the ciliidae, which can breed in a well or even in water reservoirs. Later, the author admits their presence by saying: “Moustiques extrêmement rares”. Domestic mosquitoes and the others are evidently excluded, they cannot easily maintain themselves for many years once they have become very rare. But when a species is nocturnal, dwellers on the premises often declare that they are absent or scarce, even when one can easily find specimens bloated with blood in the bedrooms. But even if mosquitoes were twenty times as rare as they are in Rio, they would find twenty times more cases of leprosy. One bite out of twenty or twenty five might occur in a leper.

In any case it is easy to see that the author mentioned knows very little about mosquitoes since he adds “aucun marécage n'existe dans leur voisinage”. It is unknown to me that filariasis, all transmitted by the same mosquito, needs swamps. This disease which has not been seen in Hawaii, was not even excluded from Maré.

Professor Terra has also objected that no cases of infection with leprosy in the zone of the Hospital dos Lázaros were known. I can assure him that Dr. Azevedo Lima (former director) told me the opposite several times and considered it a reason for moving the hospital. In that place mosquitoes are not absent though there are no swamps in the vicinity.

Several observations show that there are occasions when the bacilli are circulating in the blood of lepers: acid-fast bacilli have also been found in mosquitoes. Neither of those occurrences is very common. Nor are all these bacilli alive, since most of the bacterial emboli are limited or involve. Multiplication (of the germ) in the mosquito has not been demonstrated. The transmission of the disease by the contaminated mosquito can not occur frequently. But this is just one of the necessary conditions, because if it were not so acute epidemic would occur. In a place where cases of leprosy attains a minimum of 2% and where there are blood-sucking mosquitoes, which is certainly the status in Hawaii, one may estimate that out of 100 mosquitoes which bite one must certainly have bitten a leper before. A person who does not use a mosquito net is easily bitten by fifteen mosquitoes per night, or about five thousand times a year. He would thus receive fifty suspect bites and it would be enough that one of these should prove infectious to obtain a very rapid increase of the disease. Even if only one bite out of five
hundred were infectious the disease would go on increasing. But it would be necessary to examine many thousands of mosquitoes to find the one able to infect.

There are many specialists in leprosy who accept the mosquito as one of the transmitters of the disease, together with other blood-sucking insects, direct contagion etc. This cannot explain why in so many places leprosy does not spread, though there are fleas and bedbugs as well as the opportunity for direct contagion. Were the nasal mucous and the secretion of ulcers infectious, washerwomen should provide a higher percentage of cases.

Those who have followed the evolution of leprosy or have seen quite incipient cases should know that in this country leprosy generally begins with a hyperaemic, more or less infiltrated spot; the same occurs in other places as I saw for myself in Hawaii. It is difficult to consider this spot as anything other than the initial lesion. I have seen a large number of such cases, which are entirely unknown to most doctors. Now the majority of these cases show the spot on the back of the hand or foot, or on the face, preferably on the forehead, a rather common localization. In these cases, the mucous membrane of the nose is as rule not yet affected, nor are any other mucous membranes, which certainly should be the case of leprosy spread in the manner of syphilis. On the other hand, the locations just mentioned are just what one would expect in the case of the transmission by mosquitoes, a fact which has always impressed me from the very beginning of my studies on leprosy.

Formerly there was always the objection that diseases transmitted by mosquitoes and other blood-suckers were not diseases due to bacteria, but after the recent studies on the plague this argument is no longer valid. On the contrary, it has been proved that a bacillary disease is transmitted by one blood-sucking insect only and not by all the other forms. Similar conditions are seen in spirillosis and exanthematic typhus. Formerly, a number of authors who failed to obtain positive results in the transmission of plague by fleas opposed this doctrine, but, by persisting, the explanation for these negative results was brought to light and the question can be regarded as solved. But when one stops to think of the many lives that are sacrificed because of the willful opposition always made to any new measures through ignorance or obstinacy one cannot imagine anything more discouraging or more tragic.

There may be no objection to including the other blood-sucking diptera among facultative transmitters of leprosy but there is formal indication for the mosquitoes. I do not deny that isolation of leprosy in the manner in which at present it is carried out may hinder dissemination, somewhat more difficult, especially when leper settlements are far from other human dwellings and offer unfavorable conditions for mosquitoes, such as in islands swept by constant winds. What I do contest is that the form of isolation practiced until now, without the help of new factors, will lead to the aim worked for, namely the prevention of new cases. As it is, the disease can only end by the death or the cure of the lepers, which can be expected in from ten to twenty five years. Facts show that many centuries of isolation have not eradicated leprosy from China. In Hawaii, thirty or more years of isolation have not considerably altered the percentage of lepers. In Norway, sixty years of the same regime saw the number of patients drop officially from 2,598 to 243. The decrease, which is in part due to other factors, seems a very great triumph but it is not really so, since, at the same rate, another sixty years would bring the cases down to twenty four and nearly two hundred years would go by before the final disappearance
of leprosy. One is tempted to ask whether the same regime applied to tuberculosis would not be far more promising of results. And yet, no one has suggested applying it to this disease or to others in which the mode of transmission erroneously attributed to leprosy is much more probable.

Here, in Brazil, some of the more advanced cases of leprosy are isolated, especially among the poor. The well-to-do sometimes try to isolate themselves in their own houses. This partial isolation has not given even the partial result which might have been expected of it. I do not know of any place in Brazil where leprosy has been got rid of. It occurs even in the cities including the federal capital.

If the transmission of leprosy is due to blood-sucking insects, as I have already indicated, this is probably the only usual mode of transmission. Two mosquitoes, *Culex fatigans* and *Culex pipiens*, which are very much alike, probably cover the whole territory of endemic leprosy. Though other domestic species of Culicidae such as *Stegomyia* and others cannot be entirely excluded. As to Simulidae, Phlebotomus, Culicoides etc., all one can say is that they cannot be exclusive transmitters. Until now it is only in the maritime Alps that the active foci of leprosy have been pointed out as entirely free from mosquitoes. Such statements should be carefully investigated, as all those who are familiar with the history of malaria should know. We are also poorly informed as to the presence and frequency of the different blood-sucking insects in Norway and Iceland. If in these places mosquitoes should prove to be completely absent, one might have to think of Simulidae, which are common in mountain regions and absent from most large cities, but these and other blood-sucking Diptera can only be of local interest. These and other points are in great need of investigation.

The essential thing is that until now no other explanation is available for the problem of why leprosy spreads easily in some regions and is extremely rare in others. Until a better hypothesis is provided, the idea of transmission by blood-sucking *diptera* has every right to be considered. It is not an idle fancy, but a perfectly rational proposition, accepted by some good observers and increasingly supported by analogous facts. One really cannot elude the obligation of adding anti-mosquito prophylaxis to all other attempts at isolation of lepers. One has not got the right to sacrifice individual liberty without offering a maximum guarantee of the efficacy of this sacrifice. It is on account of the responsibility that rests upon us that I have spoken here and not because I have any hope of convincing everyone. I leave the doubtful satisfaction of fighting new trends to the followers of those who tried to preserve yellow fever among us by opposing anti-mosquito prophylaxis and who are now trying to do the same in regard to another equally important issue.