CHINA.

IMPERIAL MARITIME CUSTOMS.

II.—SPECIAL SERIES: No. 2.

MEDICAL REPORTS,

FOR THE HALF-YEAR ENDED 30TH SEPTEMBER 1886.

32nd Issue.

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December 20, 2000

INSPECTOR GENERAL'S CIRCULAR No. 19 OF 1870.

INSPECTORATE GENERAL OF CUSTOMS,

PEKING, 31*st December* 1870.

SIR,

1.—IT has been suggested to me that it would be well to take advantage of the circumstances in which the Customs Establishment is placed, to procure information with regard to disease amongst foreigners and natives in China; and I have, in consequence, come to the resolution of publishing half-yearly in collected form all that may be obtainable. If carried out to the extent hoped for, the scheme may prove highly useful to the medical profession both in China and at home, and to the public generally. I therefore look with confidence to the co-operation of the Customs Medical Officer at your port, and rely on his assisting me in this matter by framing a half-yearly report containing the result of his observations at.....upon the local peculiarities of disease, and upon diseases rarely or never encountered out of China. The facts brought forward and the opinions expressed will be arranged and published either with or without the name of the physician responsible for them, just as he may desire.

2.—The suggestions of the Customs Medical Officers at the various ports as to the points which it would be well to have especially elucidated, will be of great value in the framing of a form which will save trouble to those members of the medical profession, whether connected with the Customs or not, who will join in carrying out the plan proposed. Meanwhile I would particularly invite attention to—

a.—The general health of.....during the period reported on; the death rate amongst foreigners; and, as far as possible, a classification of the causes of death.

b.—Diseases prevalent at.....

c.—General type of disease; peculiarities and complications encountered; special treatment demanded.

d.—Relation of disease to { Season. / Alteration in local conditions—such as drainage, etc. / Alteration in climatic conditions.

e.—Peculiar diseases; especially leprosy.

f.—Epidemics { Absence or presence. / Causes. / Course and treatment. / Fatality.

Other points, of a general or special kind, will naturally suggest themselves to medical men; what I have above called attention to will serve to fix the general scope of the undertaking. I have committed to Dr. ALEX. JAMIESON, of Shanghai, the charge of arranging the Reports for publication, so that they may be made available in a convenient form.

3.—Considering the number of places at which the Customs Inspectorate has established offices, the thousands of miles north and south and east and west over which these offices are scattered, the varieties of climate, and the peculiar conditions to which, under such different circumstances, life and health are subjected, I believe the Inspectorate, aided by its Medical Officers, can do good service in the general interest in the direction indicated; and, as already stated, I rely with confidence on the support and assistance of the Medical Officer at each port in the furtherance and perfecting of this scheme. You will hand a copy of this Circular to Dr. ....., and request him, in my name, to hand to you in future, for transmission to myself, half-yearly Reports of the kind required, for the half-years ending 31st March and 30th September—that is, for the Winter and Summer seasons.

4.— * * * * *

I am, etc.,

(Signed) ROBERT HART,
I. G.

THE COMMISSIONERS OF CUSTOMS,—*Newchwang*, *Tientsin*, *Chefoo*, *Hankow*, *Kiukiang*, *Chinkiang*, *Shanghai*, *Ningpo*, *Foochow*, *Tamsui*, *Takow*, *Amoy*, *Swatow*, and *Canton*.

SHANGHAI, *1st December 1886.*

SIR,

IN accordance with the directions of your Despatch No. 6 *A* (Returns Series) of the 24th June 1871, I now forward to the Statistical Department of the Inspectorate General of Customs, the following documents:—

Further Observations on Filaria Sanguinis Hominis in South Formosa, pp. 1–38.

Report on the Health of Takow and Taiwan-fu (Anping) for the two and a half years ended 30th September 1886, pp. 39–49.

Report on the Health of Amoy, pp. 56, 57;

Report on the Health of Foochow, pp. 59–67;

Report on the Health of Ningpo, pp. 68–70; each of these referring to the year ended 30th September 1886.

Report on the Health of Tamsui and Kelung, pp. 50–55;

Report on the Health of Hoihow (Kiungchow), p. 58;

Report on the Health of Shanghai, pp. 71–75; each of these referring to the half-year ended 30th September 1886.

An Appendix of Plates (with brief descriptive letterpress) illustrative of disease encountered among Chinese received into foreign hospitals in Shanghai, p. 76.

I have the honour to be,

SIR,

Your obedient Servant,

R. ALEX. JAMIESON.

THE INSPECTOR GENERAL OF CUSTOMS,
PEKING.

The Contributors to this Volume are:—

W. W. MYERS, M.B., CH.M.	Takow and Taiwan-fu.
A. RENNIE, M.B., C.M.	Tamsui and Kelung.
B. S. RINGER, M.R.C.S., L.S.A.	Amoy.
J. H. LOWRY, L.R.C.P.Ed., L.R.C.S.Ed.	Hoihow (Kiungchow).
T. RENNIE, M.D., CH.M.	Foochow.
C. C. DE BURGH DALY, M.B., CH.M.	Ningpo.
R. A. JAMIESON, M.A., M.D., M.R.C.S.	Shanghai.

FURTHER OBSERVATIONS ON FILARIA SANGUINIS HOMINIS IN SOUTH FORMOSA.

By W. W. MYERS, M.B., Surgeon to the "David Manson Memorial" Hospital.

DURING the four years that have elapsed since the publication of my last paper* on this subject, I have from time to time been engaged in making the further observations which I now record; and, simultaneously, have lost no opportunity of reinvestigating those already communicated, aided in the latter by the criticisms my former paper elicited.

I can only reaffirm my conviction as to the absence of the filaria sanguinis hominis from this island, and that this is in all probability attributable to the non-existence of a suitable intermediary host for the embryo.

On several occasions supplies of mosquito larvæ were got over from Amoy, some of which came to maturity, thus enabling me in a few instances to watch the embryo filaria during one or two days of intra-mosquito existence, contrasting the inhospitality shown to the parasite by the native insects under observation at the same time.

Incomplete as the experiments necessarily were by reason of the limited term of life vouchsafed to the mainland mosquito over here, still, for two or three days they afforded me an opportunity of again convincing myself of the accuracy of Dr. MANSON'S observations and descriptions.

Under ordinary circumstances I should have thought this reiteration unnecessary, but from a quotation given in Dr. MANSON'S paper, read before the Linnæan Society,† Professor VON LEUCKART is reported by Herr SCHEUBE, of Leipsic, when lecturing on the blood filaria, to have written as follows:—

> MYERS wollte dessen Versuche auf Formosa, wo die Filariakrankheit selbst nicht autochthon vorkommt, nachmachen, kam aber zu dem Resultate, dass die Filaria-embryonen von den Muskitos vollständig verdaut wurden. . . . .

From this it would seem that the distinguished writer has misunderstood my remarks, and has been led to believe the very opposite of that which it was my object to convey. Thus, though the absence of the filaria sanguinis hominis from South Formosa was recorded, still I suggested that the mosquitos found here differed from those found on the mainland, inasmuch as they "digested instead of nurturing" the filarial embryo. In support of this view the various attempts made to filariate monkeys were described, and their failure shown to depend on my inability to obtain a species of mosquito in the island capable of performing the part of intermediary host, or to preserve those imported from Amoy long enough to effect perfect maturity of the filarial embryo. It may be further mentioned that I happened to be in Amoy when Dr. MANSON was collecting the specimens of mosquitos he afterwards forwarded to the late Dr. COBBOLD, and which that eminent helminthologist used in London to demonstrate the

* Customs *Medical Reports*, xxi, 1–25; and *Transactions of the Epidemiological Society, London*, 1881–82, i, 126.

† *Transactions of the Linnæan Society*, vol. ii, part x, 368.

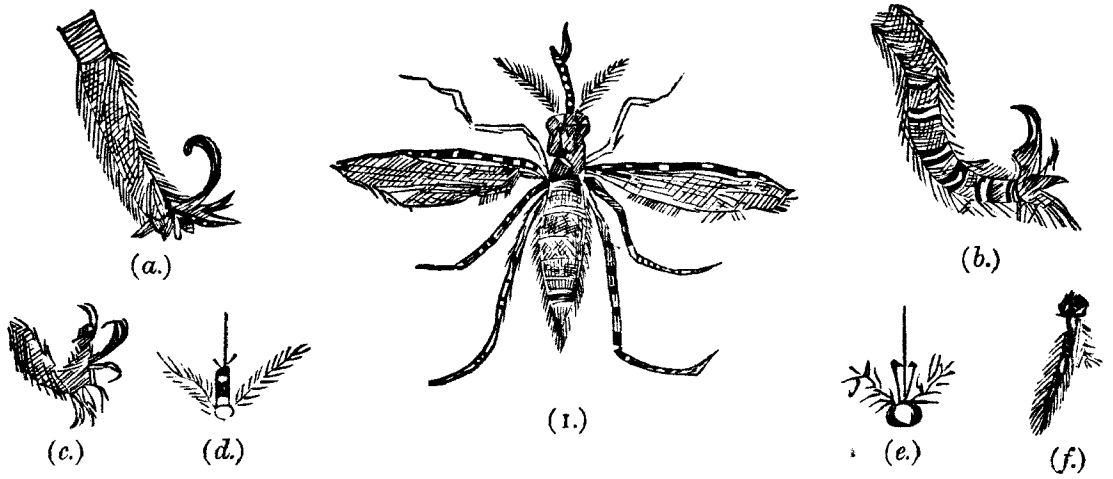
changes described by Dr. MANSON as occurring in the filaria while in the mosquito; and I admit that on more than one occasion the daily metamorphoses were distinctly seen by me, and further, that I repeated the observations up to the third day in Formosa with mosquitos obtained from Amoy, and arrived at precisely similar conclusions.

Further extensive and careful investigation here has failed to discover a mosquito like the Amoy filaria-nurturing variety, either in species or capacity for nursing the blood embryo.

My searches have included many and distant regions of South Formosa, and to the kindly aid of the Rev. DAVID SMITH, late of the English Presbyterian Mission, a no less constant than indefatigable traveller in the interior, I am indebted for specimens collected in various localities. This gentleman succeeded in obtaining one variety which differed from those commonly seen here, inasmuch as its body was perfectly diaphanous before feeding, and even after this operation had been completed the transparency was such as would have made it a splendid medium for observing *in situ* any changes going on within, had it been possible to bring live specimens thus far. I am not able, therefore, to say from personal observation of its habits that it is hostile to embryo development, though analogy, and the marked absence from the region it frequents, of filarially-infested persons or disease attributable to the parasite, tend strongly to suggest that it may also be assumed incapable of playing the part of nurse.

I now proceed to give the measurements and description of the only varieties of mosquito I have been able to discover, striving by the accompanying sketches to facilitate reference and recognition. For comparative purposes similar descriptions and sketches of what I will call the true filaria-nurturing mosquito, as got from Amoy, are also given.

(1.) TAKOW COMMON (or "TIGER") MOSQUITO.



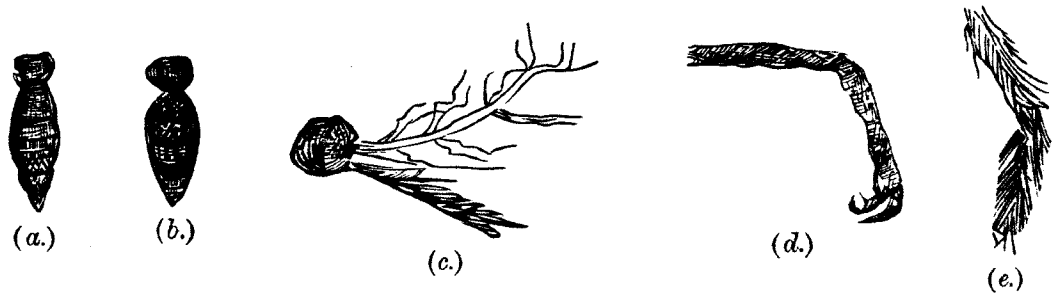
(1.) Front leg has 3 joints.
Middle „ 2 „
Posterior „ 5 „
Wings, $\frac{10}{16}$ inch from base to tip, transparent, ribbed.
(*a*.) Middle leg, $\frac{28}{16}$ inch.
(*b*.) Posterior leg.
(*c*.) Terminal claw, $\frac{30}{96}$ inch.
(*d*.) Proboscis (male), with winged palpi, plumose antennæ.
(*e*.) Head and proboscis (female), pilose antennæ.
(*f*.) Ligulets on proboscis, with hairs protruding at end.

By far the commonest Formosan mosquito is the striped or tiger variety (1.). The appearance to which its name is due is caused by a series of black and white stripes on the second and third pair of legs, thorax, and proboscis; while in further justification of the appellation, most formidable claws (*c.*), or indeed talons, arm the extremities of the middle and posterior legs (*a.* and *b.*). At base of proboscis are a pair of palpi, with double antennæ, plumose in the male and pilose in the female (*d.* and *e.*); the proboscis (*f.*), striped, of equal diameter throughout, with pointed extremity, through which several lancet-shaped spicules may be seen protruding. Wings, dark, transparent, with delicate reticulated venation, to which are attached, generally on one side only, lanceolate appendages, or winglets, which also form a fringe on periphery.

MEASUREMENTS.

Head and proboscis . .	$\frac{8}{96}$ inch.	Legs:—1st pair, 3-jointed.	
Proboscis alone. . . .	$\frac{6}{96}$ „	2nd „ 2 „	$\frac{28}{96}$ inch.
Wings	$\frac{10}{96}$ „	3rd „ 5 „	$\frac{30}{96}$ „
Antennæ	$\frac{6}{96}$ inch.		

(2.) BROWN MOSQUITO found in TAKOW.



(*a.*) Ventral aspect. Thorax and abdomen, $\frac{1}{96}$ inch long; head, $\frac{2}{96}$ inch long.
(*b.*) Dorsal aspect. Brown head and tip of abdomen, intervening part covered with black scales.
(*c.*) Head and proboscis with pilose antennæ; short, abrupt palp at base of proboscis. Hairs on antennæ arranged in fours.
(*d.*) Posterior leg.
(*e.*) Middle leg.

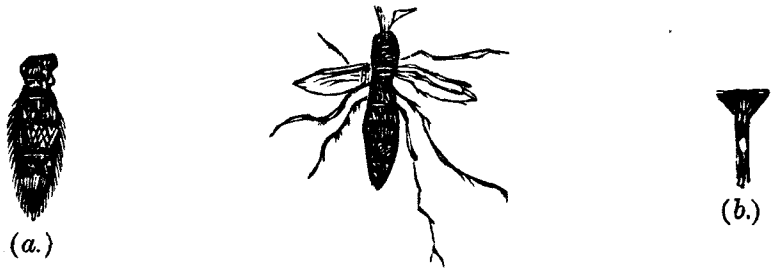
Another not uncommon variety may, on account of its colour, be at first sight mistaken for the filaria-nurturing species, but by closer investigation it can be easily distinguished. This mosquito (2.) is light brown all over save on the back, the central part of which is covered with dark scales (*b.*); the posterior leg (*d.*) has two short claws and is smoother than the middle one, which latter is without claws, though covered with rough hair-like processes (*e.*). The proboscis (*c.*) is distinctly hirsute from base to tip, of equal diameter throughout, tapering to a point at end. At base of proboscis are two short, abrupt palpi and a pair of antennæ, having

long hairs arranged in sets of four, at equal distances from each other. Wings similar to those of the "tiger" variety, though somewhat darker.

The following measurements were taken:—

Body (thorax and abdomen)	$\frac{15}{96}$ inch.	Proboscis	$\frac{6}{96}$ inch.
Head	$\frac{2}{96}$ „	Antennæ	$\frac{8}{96}$ „

(3.) EJECTING MOSQUITO.



(3.) Brown body with black stripes on back, and six black spots on each side of brown abdomen.
(a.) Ventral aspect.
(b.) Head and proboscis.

The third and last variety I have been able to differentiate is given more on account of its remarkable peculiarities than for anything else. This insect I call "Ejecting," from its habit of ejecting at its anal extremity the blood it draws in while feeding. Discharge and suction seem to go on simultaneously, for as soon as one drop falls off another commences to form, which in turn gives place to its successor. This process has been observed for five minutes consecutively, without any apparent increase of bulk in the mosquito. The blood is certainly changed during its passage through the alimentary canal, for the fluid discharged, though red in colour, is much more serous and does not clot. On microscopic examination the colour is seen to be due to disintegrated and shrivelled corpuscles with some granular *débris*, probably also the remains of broken-down blood globules. This peculiarity would seem at once to stamp the insect as physically incapable of acting as filarial host, but may still be deemed of sufficient interest to render a more detailed description acceptable.

The whole insect (3.) is brown, with black lines on back. On the belly (*a.*) six black spots are symmetrically arranged on each side of median line. The proboscis (*b.*) is marked, like that of the "tiger" variety, with three broad bands, two black, at base and tip respectively, and an intervening uncoloured one; it is smooth and of equal calibre throughout, with two long straight antennæ. The anterior leg has three joints; the middle leg has four joints; the posterior leg has five joints.

MEASUREMENTS.

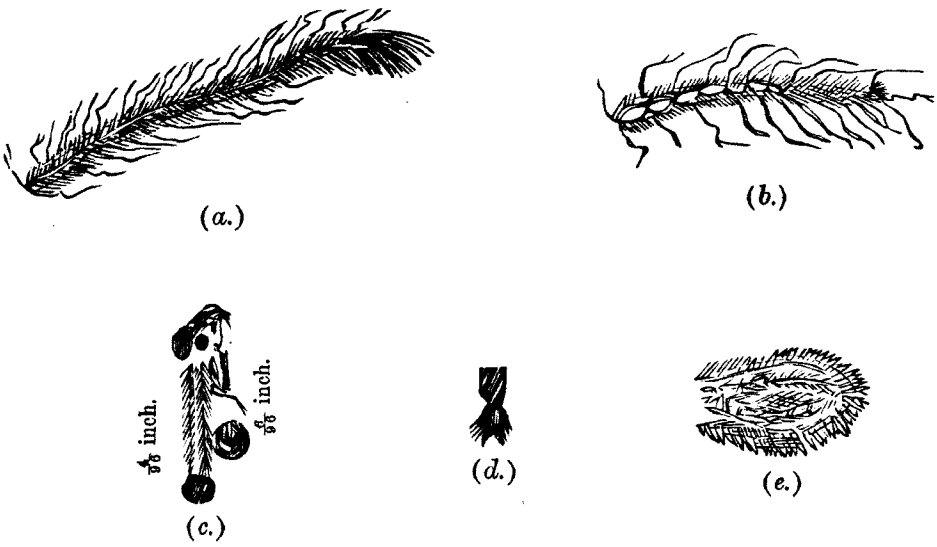
Body	$\frac{19}{96}$ inch.	Head	$\frac{2}{96}$ inch.
Thorax	$\frac{3}{96}$ „	Proboscis	$\frac{7}{96}$ „
Abdomen	$\frac{14}{96}$ „		

I may add that this mosquito is not very common, and seems to be confined to a limited area in Takow. The foregoing are all the varieties I have been able to distinguish as yet in South Formosa.

These descriptions are by no means complete, but as the distinctions given are well marked and offer readily recognisable points of difference, they may serve as incentives to further and more minute examination which others, resident in places where the filaria-nurse insect is found, may be prompted to undertake.

The following is the result of repeated examinations of the filarial mosquito obtained from Amoy, and may prove useful in suggesting a more minute and detailed description by those possessing greater facilities for investigation:—

(4.) FILARIA-NURTURING MOSQUITO from AMOY.



(a.) Long antenna.
(b.) Short antenna.
(c.) Head and proboscis, with single palp.
(d.) Tip of proboscis, showing bulbous extremity.
(e.) Wing.

A dark brown body, smaller than that of any variety I have found here. Posterior leg covered with delicate, leaf-like appendages; no claws. At base of proboscis (*c.*) are two antennæ (*a.* and *b.*), beaded, with filamentary processes coming off at each joint; one shorter than the other, the bead-like joints of former (*a.*) larger than those of latter (*b.*), while at each constriction there are only two filaments, one on each side; short, abrupt palpi. The proboscis terminates in a *cone-like bulb* (*d.*), markedly differentiating the insect from those previously described. Wings (*e.*), ribbed, covered with obtuse, leaf-like appendages arranged featherwise on each rib and round the periphery.

The following are the measurements taken:—

Head	$\frac{2}{96}$ inch.	Long posterior leg . . .	$\frac{22}{96}$ inch.
Proboscis	$\frac{4}{96}$ „	„ antenna	$\frac{6}{96}$ „
Wings (from base to tip) .	$\frac{8}{96}$ „	Short „	$\frac{5}{96}$ „

Annexed is a table of comparative measurements, got from the South Formosan varieties and the Amoy filarial mosquito, showing the parts distinctly different in each species.

COMPARATIVE MEASUREMENTS of SOUTH FORMOSAN MOSQUITOS and of FILARIA-NURTURING INSECT from AMOY.

PARTS.	SOUTH FORMOSAN.			AMOY.
	"Tiger" Mosquito.	"Brown" Mosquito.	"Ejecting" Mosquito.	Filarial Mosquito.
	Inch.	*Inch.*	*Inch.*	*Inch.*
Head and proboscis	$\frac{8}{96}$	...	...	$\frac{6}{96}$
Head	$\frac{2}{96}$	$\frac{2}{96}$	$\frac{2}{96}$	$\frac{2}{96}$
Proboscis	$\frac{6}{96}$	$\frac{6}{96}$	$\frac{7}{96}$	$\frac{4}{96}$
First pair of legs	...	...	...	...
Second „	$\frac{28}{96}$	...	...	...
Third „	$\frac{30}{96}$	...	...	$\frac{22}{96}$
Antennæ	$\frac{6}{96}$	$\frac{8}{96}$	...	long $\frac{6}{96}$, short $\frac{5}{96}$
Wings	$\frac{10}{96}$	...	...	$\frac{8}{96}$
Body	...	$\frac{16}{96}$ (thorax & abdomen)	$\frac{12}{96}$ (whole)	...
Thorax	...	...	$\frac{3}{96}$	...
Abdomen	...	...	$\frac{14}{96}$	...

From these and other observations I feel justified in reasserting that the filarial mosquito, or at least that species which acts as such on the mainland, is absent from the south part of this island; while, judging from the absence of filarial disease all over Formosa, it is almost certain that this essential intermediary, for some reason as yet unknown, cannot or does not exist at all in the island. People are constantly coming and going from Amoy, water tanks arrive every day, but still the closest search has failed to discover a trace of the Amoy insect anywhere in the southern half of Formosa.

I also arrange descriptions of the four varieties of mosquito in parallel columns to further facilitate comparison :—

South Formosan Varieties.			Amoy Species.
"Tiger" Mosquito.	"Brown" Mosquito.	"Ejecting" Mosquito.	Filaria-nurturing Mosquito.
Striped black and white on body, proboscis, 2nd and 3rd pair of legs.	Light brown body and head; back covered with dark scales.	Brown body, with black lines on back, and black spots on belly symmetrically arranged on each side of median line.	Dark brown body, generally smaller than other varieties.
Middle and posterior legs with claws.	Posterior leg with two short claws; middle, hirsute.	.....	Legs unclawed, covered with obtuse, leaf-like appendages similar to those on wings.
Proboscis of equal calibre throughout.	Proboscis of equal calibre throughout.	Proboscis straight and of equal calibre, black and white stripes on bands.	Proboscis terminates in cone-like bulb.
Two palpi	Two short, abrupt palpi...	Short palpi.	
Two antennæ, plumose or pilose.	Two antennæ, with filamentary processes arranged in fours.	Two long, straight, naked antennæ.	Two antennæ of different lengths, beaded or distinctly jointed, pilose—the longer with single long filaments springing from each constriction at joints; shorter, with longer joints than its fellow.
Wings clear, transparent, ribbed, with lanceolate winglets or appendages attached to ribs and round periphery.	Dusky wings, ribbed, with few winglets or appendages attached to ribs and round periphery.	.....	Wings ribbed, with delicate leaflets arranged featherwise on each side of ribs, and fringing periphery.

Before going on to describe the further investigations made to discover the ultimate destination of embryo filariæ remaining in the blood of the human host, it may be as well here to notice the leading objections raised by those who criticised my last paper.

Dr. Manson, and to some extent Dr. Cobbold, thought the great difficulty in accepting my views was that they seemed to suggest periodic or intermittent reproduction on the part of the parent worm, and indeed the former made this almost his sole ground of dissent.

Assuredly, if we take it for granted that all the embryos in the body during the hours they appear in the blood are contained in the vascular system, then if these are destroyed their place can only be filled by a new swarm; but knowing as I did, what Dr. Manson also calls attention to, that in cases of chyluria and lymph scrotum a continuous outcome of embryos is kept up during the whole day, I did not intend it to be understood that the

supply was intermittent or absorbed as soon as provided. I did not discuss this part of the subject at length because more occupied with the question as to whether the embryos in the blood died there or betook themselves to some resting place. From what I state hereafter, however, it will be seen that the suggestions I then offered and those I now present as to filarial reproduction and existence in the body of the primary host are not inconsistent with each other, and that neither intermission of production nor improbable enormity of swarm is essential to the views put forth. I was not fortunate enough to obtain Dr. MANSON'S corroboration of my experiments as to the longevity and vitality of the embryo at the different hours of its existence in the blood; but I was much gratified to find that Dr. STEPHEN MACKENZIE, in his kindly review of my paper,* stated that he had repeated my experiments and was able to confirm them. From this and the fact of three other observers (two of them medical men) having checked my observations on the spot and agreed with me, I may hope that some accidental circumstance interfered with the observations made by Dr. MANSON, and perhaps prevented his arriving at similar results to those got in London and Formosa.

Having verified as far as possible the experiments and observations previously detailed, I have devoted most of my efforts towards determining the question left unsettled as to the ultimate destination of the filariæ not abstracted by the mosquito.

In considering at the offset the data we have to work on, there is one fact which seems to me to stand forth very prominently, but which has not, so far as I know, been dwelt on to the extent its value as a preliminary factor in clearing the way for further investigation seems to warrant. I allude to the absolute need there seems to be for the regular and periodical removal of certain numbers of the embryos, so as to make room for those constantly coming into existence, and which must in turn have their chance of mosquito deliverance. In other words, it seems very certain that the unremoved filariæ must go somewhere whence their return to the blood is impossible. Assuming that parturition in the parent is continual, at the lowest estimate a single worm should produce about 2,000,000 embryos in the 24 hours; for Dr. MANSON tells us that the minute filaria corvi torquati was seen to give birth to "20 or 30 embryos" every few seconds.† If we suppose this number to be brought forth each three seconds, we should obtain a total of 864,000 in the 24 hours, or, say, in round numbers, 1,000,000.

In estimating the number of filariæ present at one time in the blood of a man, the difficulties are very great, and indeed only an approximate result can be hoped for. To arrive at this, let us assume an adult weighing, say, 12 stone, and therefore possessing about 15 lb. of blood; let us suppose the amount that goes on a slide to be about a minim, and that the total quantity of blood in his body would be about 115,200 minims. With a view to getting some idea of the number of filariæ on a slide, *i.e.*, in a minim of blood, I have gone over the records of filarial finds at different hours and for several days. Taking the days and hours when the maximum and minimum number of embryos were present, and striking an average, I have been able to arrange a series of 100 records, covering several days for each individual.

* *London Medical Record*, 1882, 5. † Customs *Medical Reports*, xxiii, 13.

I should mention that I have utilised the Customs *Medical Reports* and other publications for this purpose. From these the average number of filariæ found in one minim was 13. On this basis there would be 1,497,600 filariæ present in the whole vascular system, or say 1,500,000. Now, if the calculation as to the daily produce of the minute filaria corvi torquati be tolerably near the mark, it will not be over-estimating the capacity of the filaria sanguinis hominis to assume the daily produce as being close on 2,000,000. Dr. MANSON calculates the number of filariæ present at one time in an infested man at "more than 2,000,000,"* but does not say how he comes at this result. For my present purpose I propose taking the figures I have given. By the calculation, then, the parent worm would produce about 500,000 more filariæ each day than appear in the blood.

Further on, when I submit my views as to the phases of existence passed through by the embryos in the human body, I will offer suggestions as to why this is and how it accords with the requirements of the parasite and the adjustments of nature.

Even supposing exactly the same number were produced as are seen in the circulation, and that the new swarm only entered the blood every 12 hours, it is obvious that at this rate, unless a very considerable outlet were provided, a block must soon ensue. It is clear that even under the most favourable circumstances mosquito aid would be comparatively useless; then what becomes of the unrescued residuum? It is highly improbable the embryos can re-enter the lymphatic system—the valvular folds at the entrance of the thoracic duct would bar retreat by that opening, to say nothing of other forces hostile to such an attempt; nor does it seem probable that, like the white corpuscles, they can make their way through the capillary walls. Even if they could, however, the evils of constant advent, with no relieving means of withdrawal, would be just as conspicuous and urgent. They do not rest in the organs, as Dr. MANSON at first thought might be the case, for he tells us† that in filarious patients blood aspirated from the spleen and that coughed up during the day contained no filariæ.

I am also in a position to affirm the same of splenic blood, with the addition of like negative results obtained from several liver aspirations. But even in the absence of these proofs by exclusion, it seems to me that anything short of complete removal from the economy, giving space to the crowds fast collecting, must be inadequate, and therefore that all suggestions involving accumulation, such as temporary stay in this or that place, must be put aside as inapplicable to the obvious requirements of the case. My observations—and I have tried to devise special experiments for the purpose—tend to make me question very much whether the embryo has any inherent power of locomotion. No doubt there is very vigorous action, but this seems to be all directed towards the centre of the circle formed by the parasite; and although I have placed it in positions favourable to freedom of motion, such as between comparatively separated glasses, adding fluid of serum density so as to cause the blood corpuscles to run about freely, the embryo losing none of its vigour but stretching itself out at times as though to attach red globules, I could not detect the slightest onward progress. I have put the blood in glass capillary tubes, where one would expect locomotive powers to show

* Customs *Medical Reports*, xiv, 9. † *Ibid.*, xxiii, 8.

themselves if present, but such has not been the case; and I have seen the same creature on the field of my microscope, when making observations on the solution question, for days, including the time when its full vigour ought to have enabled it to move if at any time competent to do so. In fact, the earliest occasion on which I have seen the embryo spontaneously moving was after 24 hours' stay in the mosquito and subsequent to shedding its integument. In the human blood-vessels I believe it is helplessly borne along by the force of the current, and this, if it is as I suspect, has an important bearing on any question dependent on the autonomous movements of the embryo after it has got into the vascular system. That it has some slight holding power I think is obvious, and I have tested this by means of currents of different strengths. Indeed, from what I saw I do not doubt that in the slowly flowing lymph current it could easily control progress, though I think not aid it; but the blood-flow certainly seems quite beyond all its powers of resistance.

Granting that the liquor sanguinis is capable of dissolving the dead filarial embryo, and holding that those parasites not extracted by the mosquito during the night die, and so make room for their successors of the following evening, the question still remains—what is it that brings about this mortality? As Dr. MANSON pointed out, it is not something connected with the mere state of rest or wakefulness, as for several hours before the host goes to sleep the embryos are disporting themselves in his blood. The attraction must therefore exist in peculiar conditions of that fluid at these times; and disappearance or death must be consequent on the hæmic state during the period of embryo absence.

Dr. MANSON suggested one or two theories, such as diurnal magnetic influences, barometrical pressure, variations in temperature, etc., and made several experiments and observations to test these suppositions, with the result that he felt constrained to abandon his surmises. Dr. MORTIMER GRANVILLE seems to me to have struck the keynote at once when he pointed out, on hearing of Dr. MANSON'S discovery as to the periodicity of filarial presence in the blood, the probability of this being due to physical changes and conditions peculiar to each period. Following and supporting this conjecture came Dr. STEPHEN MACKENZIE'S brilliant and ingenious experiment, whereby he proved that reversing the hours of sleep also altered those of embryonic advent to the circulation. With a wisdom that follows "a prompt," we see this change to be nothing more than must necessarily have taken place, as the subject of Dr. MACKENZIE'S observations travelled from India to London. To illustrate what I mean I have drawn up the following table, showing the various alterations in time at different points of call on the journey home and consequently in the hours of filarial movements. Taking the difference in time between Greenwich and the chief places of each Indian presidency, I find this to be as follows:—

	H.	M.	S.
Calcutta	5	53	20
Bombay	4	51	12
Madras	5	20	59

The mean difference between the Indian shores and London would be about 5 hours, 21 minutes and 50 seconds. In ignorance of the actual port of embarkation selected by the

patient, I have to adopt this approximate method, which, moreover, will serve our present purpose equally well. The table shows the various changes undergone:—

TABLE showing VARIATIONS in TIME of FILARIAL APPEARANCE on a VOYAGE from INDIA to LONDON.

Difference of time between Greenwich and—

	H.	M.	S.
The port of embarkation in India	5	21	50
Colombo	5	19	23
Aden	3	0	10
Port Said	2	9	17
Gibraltar	0	21	24

Supposing filariæ appeared in blood at 7 P.M. mean time in India, this hour corresponds to mean time at—

	H.	M.	S.	
Colombo	6	57	33	P.M.
Aden	4	38	20	„
Port Said	3	47	27	„
Gibraltar	1	59	34	„
London	1	38	10	„

Reckoning by Indian mean time, therefore, the filariæ postpone their appearance at—

		H.	M.	S.
Colombo	for	0	2	27
Aden	„	2	21	40
Port Said	„	3	12	33
Gibraltar	„	5	0	26
London	„	5	21	50

To make this plainer, let us imagine that a filarious Fijian from Voona Point, Faviuni, one of the Fiji group and situated in longitude 170° 56′ W., makes a voyage to London, he will on arrival have exactly accomplished what Dr. MACKENZIE did in the hospital wards; that is to say, the hours his blood contains embryos in England are exactly the opposite of those during which the parasites were present in his circulation while at Faviuni. But neither Dr. MACKENZIE'S experiment nor the geographical exemplification of it he has taught us to deduce owes its present chief interest to the mere curiosity of the facts disclosed. By his ingenious idea, we are put in possession of one of the most important clues towards the solution of the ultimate destination problem that has been gained since MANSON made his mosquito nurture and periodicity observations. I say this advisedly, for we are now in a position to go a step farther than Dr. MORTIMER GRANVILLE in assuming the influences so strangely affecting the embryos to be regular and physiological ones, intimately connected with the systemic routine. By following out the hint thus given us, we may find some other and more familiar

phenomena which owe their existence to similar causes, and these traced out may perchance lead us to the solution desired.

In the regular and periodical variations of bodily temperature it would seem that we have an analogous or somewhat approximate phenomenon. No doubt the same variations take place in travelling from one part of the world to another, and what is a fixed morning and evening record in one latitude becomes quite changed with locality and other coincident circumstances.

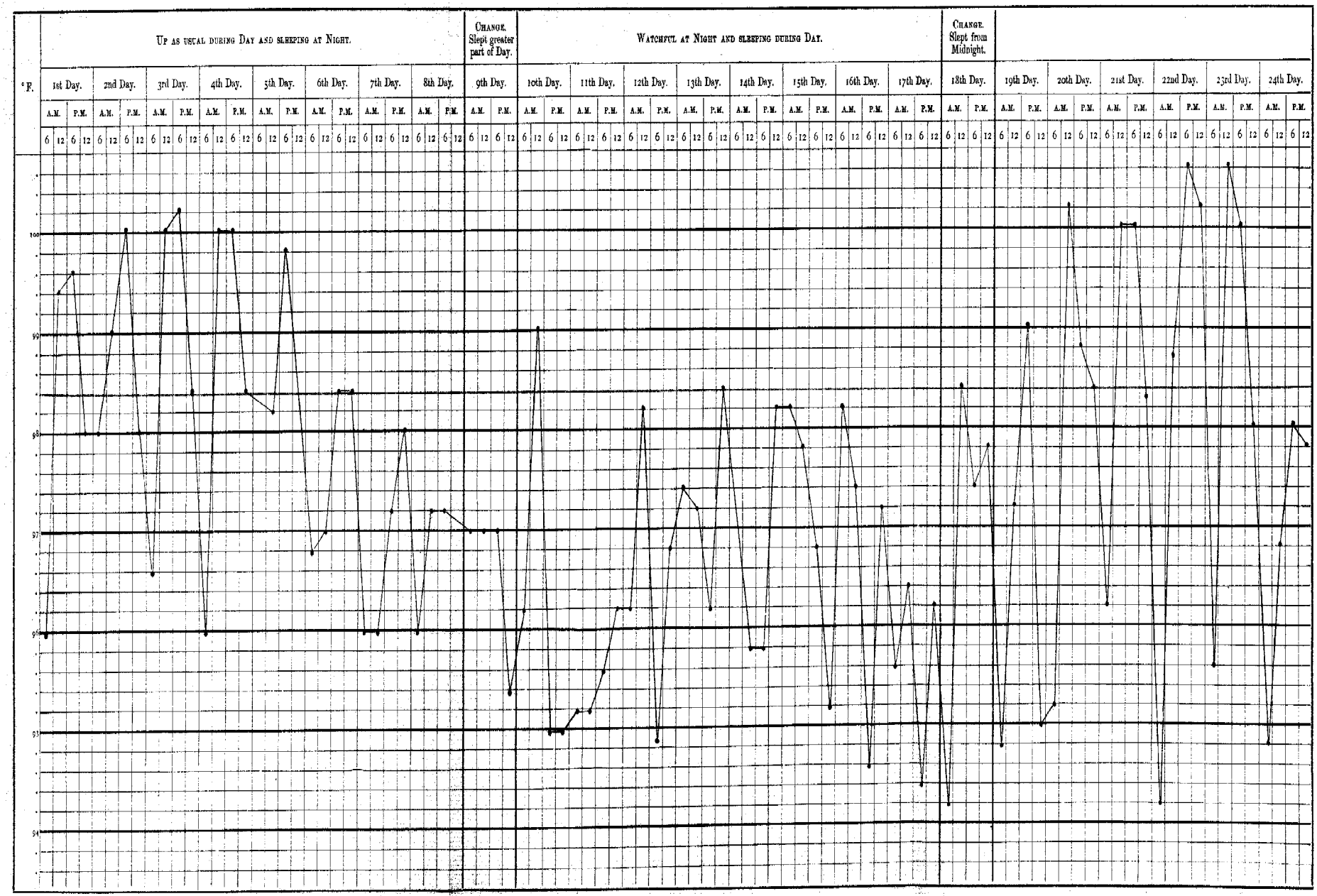
In passing I might here suggest to medical officers, whether naval or commercial, that on their various voyages careful registers of bodily temperature curves, as the ship changed her position day by day, would be highly interesting and might be productive of considerable results.

We are certainly in possession of the physical causes affecting bodily temperature; and although thermic variations themselves have little or no effect on the embryo periodicity with which they are coincident, still it appeared to me that some of the chief causes influencing animal heat may not improbably be those that act on filarial wanderings. Carrying out this idea and utilising Dr. MACKENZIE'S discovery, I have adopted that gentleman's method of turning night into day, with a view to seeing the effect this would have on the usual temperature record. No doubt the following tables and charts only depict what geographical observations must have frequently shown; but for the purposes at present interesting us I have thought it best to make confirmatory experiments.

Finding it difficult, if not impossible, to get adult native subjects to submit to the restraint and monotony entailed by the necessities of this experiment, I should have had to give up all idea of carrying out my project but for the zeal and willingness of my two little daughters, aged 11 and 12 years respectively. Being able to rely both on their intelligence and *bona fides*, I was glad to avail myself of their volunteered aid, and on the 4th January of this year the observations commenced, extending over 24 days, during the whole of which time the young people stuck loyally and steadfastly to their undertaking. The mean temperature of the air was about 60° F.

On referring to Tables Nos. 1 and 2 it will be seen that as soon as nocturnal wakefulness began the relative heights of the morning and evening records were reversed, as were those for other hours; thus the morning became the highest for the period and the evening the lowest. The table of means shows this best. While the children were keeping up at night the average nocturnal readings were much lower than those to which they were supposed to be analogous; but against this we may perhaps set the production of carbonic acid during the night as compared with that produced during daylight, being in the proportion of one during night to one and a quarter during the day; and this is said to be quite irrespective of sleep or wakefulness.

Table No. 3.—Chart of Temperature taken from H. M., æt. 12 Years, during a period of 24 Days.



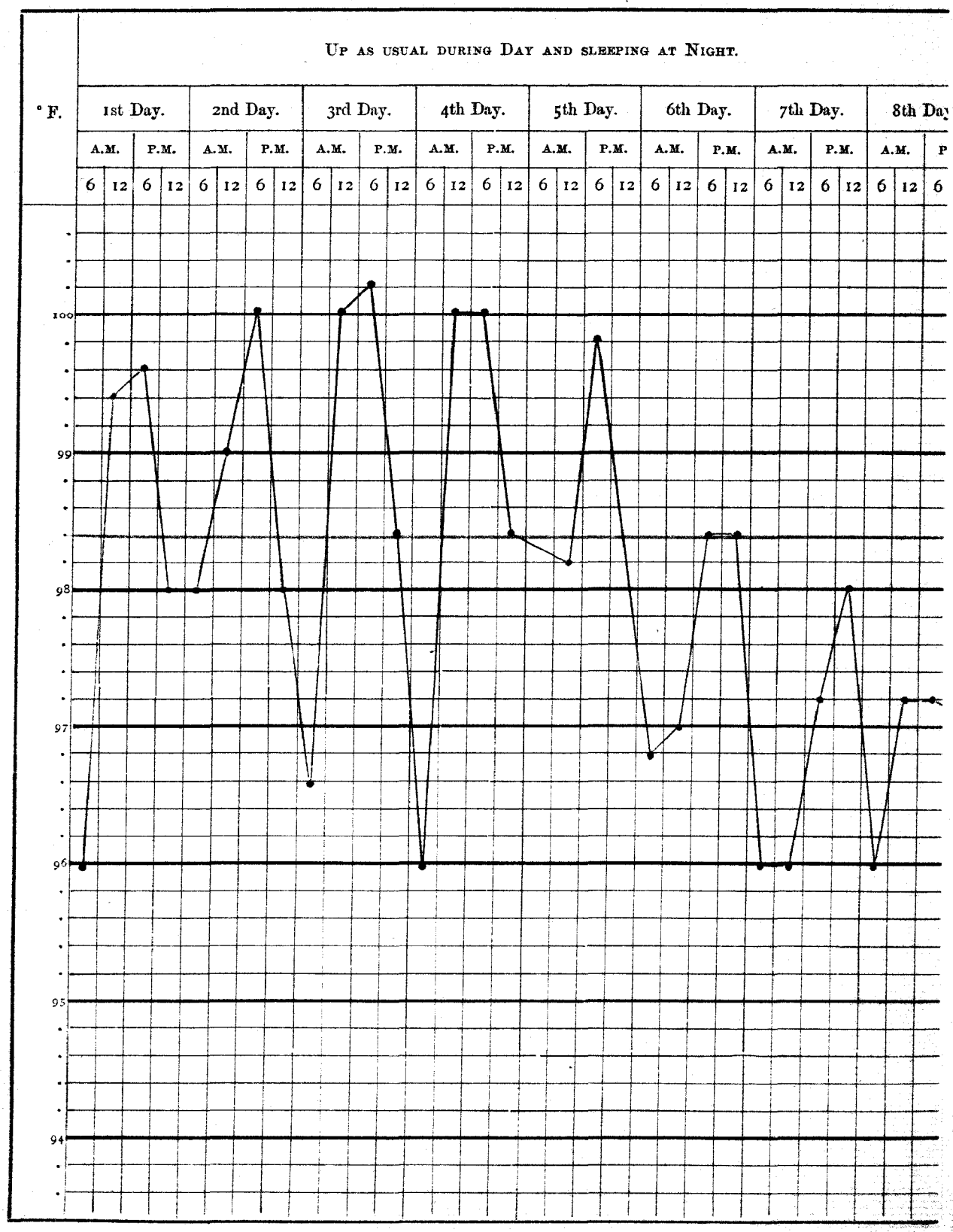

Up as usual during Day and sleeping at Night.
° F.
1st Day.
2nd Day.
3rd Day.
4th Day.
5th Day.
6th Day.
7th Day.
8th Day
A.M.
P.M.
6
12
100
99
98
97
96
95
94

TABLE No. 1.—RECORDS of TEMPERATURE taken from H. M., æt. 12 Years, during Two Periods of Eight Days, up in Daytime and sleeping at Night; also of a similar Period of Eight Days, watchful at Night and sleeping during Day. Between each Period a Day is allowed for the Change of Habit.

UP DURING DAY AND SLEEPING AT NIGHT.		WATCHFUL AT NIGHT AND SLEEPING DURING DAY.		UP DURING DAY AND SLEEPING AT NIGHT.	
	° F.		° F.		° F.
1st Day	6 A.M. 96	10th Day	6 A.M. 96.20	19th Day	6 A.M. 94.80
	12 M. 99.40		12 M. 99		12 M. 97.20
	6 P.M. 99.60		6 P.M. 95		6 P.M. 99
	12 MN. 98		12 MN. 95		12 MN. 95
2nd Day	6 A.M. 98	11th Day	6 A.M. 95.20	20th Day	6 A.M. 95.20
	12 M. 99		12 M. 95.20		12 M. 100.20
	6 P.M. 100		6 P.M. 95.60		6 P.M. 98.80
	12 MN. 98		12 MN. 96.20		12 MN. 98.50
3rd Day	6 A.M. 96.40	12th Day	6 A.M. 96.20	21st Day	6 A.M. 96.20
	12 M. 100		12 M. 98.20		12 M. 100
	6 P.M. 100.20		6 P.M. 94.90		6 P.M. 100
	12 MN. 98.50		12 MN. 96.80		12 MN. 98.40
4th Day	6 A.M. 96	13th Day	6 A.M. 97.40	22nd Day	6 A.M. 94.20
	12 M. 100		12 M. 97.20		12 M. 98.70
	6 P.M. 100		6 P.M. 96.10		6 P.M. 100.60
	12 MN. 98.50		12 MN. 98.50		12 MN. 100.20
5th Day	6 A.M. ...	14th Day	6 A.M. 97	23rd Day	6 A.M. 95.60
	12 M. 98.20		12 M. 95.80		12 M. 100.60
	6 P.M. 99.80		6 P.M. 95.80		6 P.M. 100
	12 MN. ...		12 MN. 98.20		12 MN. 98
6th Day	6 A.M. 96.80	15th Day	6 A.M. 98.20	24th Day	6 A.M. 94.80
	12 M. 97		12 M. 97.80		12 M. 96.80
	6 P.M. 98.50		6 P.M. 96.80		6 P.M. 98
	12 MN. 98.5		12 MN. 95.20		12 MN. 97.80
7th Day	6 A.M. 96	16th Day	6 A.M. 98.80		
	12 M. 96		12 M. 97.40		
	6 P.M. 97.20		6 P.M. 94.60		
	12 MN. 98		12 MN. 97.20		
8th Day	6 A.M. 96	17th Day	6 A.M. 95.60		
	12 M. 97		12 M. 96.40		
	6 P.M. 97		6 P.M. 94.40		
	12 MN. ...		12 MN. 96.20		
Change of habit.		Change of habit.			
9th Day	6 A.M. 97	18th Day	6 A.M. 94.20		
	12 M. 97		12 M. 98.50		
	6 P.M. 97		6 P.M. 97.40		
	12 MN. 95.20		12 MN. 97.80		
Means*	6 A.M. 96.52	Means	6 A.M. 96.82		
	12 M. 98.57		12 M. 97.13		
	6 P.M. 98.79		6 P.M. 95.40		
	12 MN. 98.25		12 MN. 96.68		

* These means include the whole 15 days of day-wakefulness and night-sleeping.

TABLE No. 2.—RECORDS of TEMPERATURE taken from A. M., æt. 11 Years, during Two Periods of Eight Days, up in Daytime and sleeping at Night; also of a similar Period of Eight Days, watchful at Night and sleeping during Day. Between each Period a Day is allowed for the Change of Habit.

UP DURING DAY AND SLEEPING AT NIGHT.		WATCHFUL AT NIGHT AND SLEEPING DURING DAY.		UP DURING DAY AND SLEEPING AT NIGHT.	
	° F.		° F.		° F.
1st Day	6 A.M. ....96.60 12 M. ....98.50 6 P.M. ....98.50 12 MN.	10th Day	6 A.M. ....97 12 M. ....96 6 P.M. ....95.40 12 MN. 98.50	19th Day	6 A.M. ....95.40 12 M. ....98.60 6 P.M. ....98.60 12 MN. 95.20
2nd Day	6 A.M. ....97 12 M. ....98.50 6 P.M. ....98 12 MN. 97	11th Day	6 A.M. ....98.50 12 M. ....96 6 P.M. ....96.20 12 MN. 98	20th Day	6 A.M. ....95.60 12 M. ....98 6 P.M. ....98.20 12 MN. 97
3rd Day	6 A.M. ....96.40 12 M. ....98.50 6 P.M. ....98.70 12 MN. 98	12th Day	6 A.M. ....97.20 12 M. ....99.20 6 P.M. ....97.20 12 MN. 97.20	21st Day	6 A.M. ....94.80 12 M. ....98.20 6 P.M. ....98.50 12 MN. 98
4th Day	6 A.M. ....96.80 12 M. ....98.60 6 P.M. ....99.10 12 MN.	13th Day	6 A.M. ....97.20 12 M. ....98.20 6 P.M. ....99 12 MN. 98.60	22nd Day	6 A.M. ....95.40 12 M. ....98.50 6 P.M. ....99 12 MN. 98
5th Day	6 A.M. .... 12 M. ....99.60 6 P.M. ....99.40 12 MN.	14th Day	6 A.M. ....97.20 12 M. ....97.80 6 P.M. ....96 12 MN. 98.20	23rd Day	6 A.M. ....94.40 12 M. ....98.60 6 P.M. ....99 12 MN. 98.50
6th Day	6 A.M. ....96.40 12 M. ....98 6 P.M. ....98.50 12 MN. 97	15th Day	6 A.M. ....98.20 12 M. ....99 6 P.M. ....96.20 12 MN. 95.60	24th Day	6 A.M. ....95.20 12 M. ....98.80 6 P.M. ....98.60 12 MN. 97
7th Day	6 A.M. ....96.20 12 M. ....99 6 P.M. ....98.70 12 MN. 97	16th Day	6 A.M. ....98.20 12 M. ....95.60 6 P.M. ....95.80 12 MN. 96.80		
8th Day	6 A.M. ....97.40 12 M. ....99 6 P.M. ....98.50 12 MN.	17th Day	6 A.M. ....96.10 12 M. ....96.40 6 P.M. ....94.40 12 MN. 97		
Change of habit.		Change of habit.			
9th Day*	6 A.M. ....96 12 M. ....98.50 6 P.M. ....96.40 12 MN. 95.80	18th Day†	6 A.M. ....94.60 12 M. ....97.60 6 P.M. ....98.70 12 MN. 99.60		
Means‡	6 A.M. ....96.60 12 M. ....98.47 6 P.M. ....98.42 12 MN. 97.25	Means	6 A.M. ....97.45 12 M. ....97.28 6 P.M. ....96.28 12 MN. 97.46		

* Slept greater part of day.

† Slept from 12 midnight.

‡ Means for day-wakefulness and night-sleeping include all 15 days.

TABLE No. 4.—CHART of TEMPERATURE taken from A. M., æt. 11 Years, during a period of 24 Days.

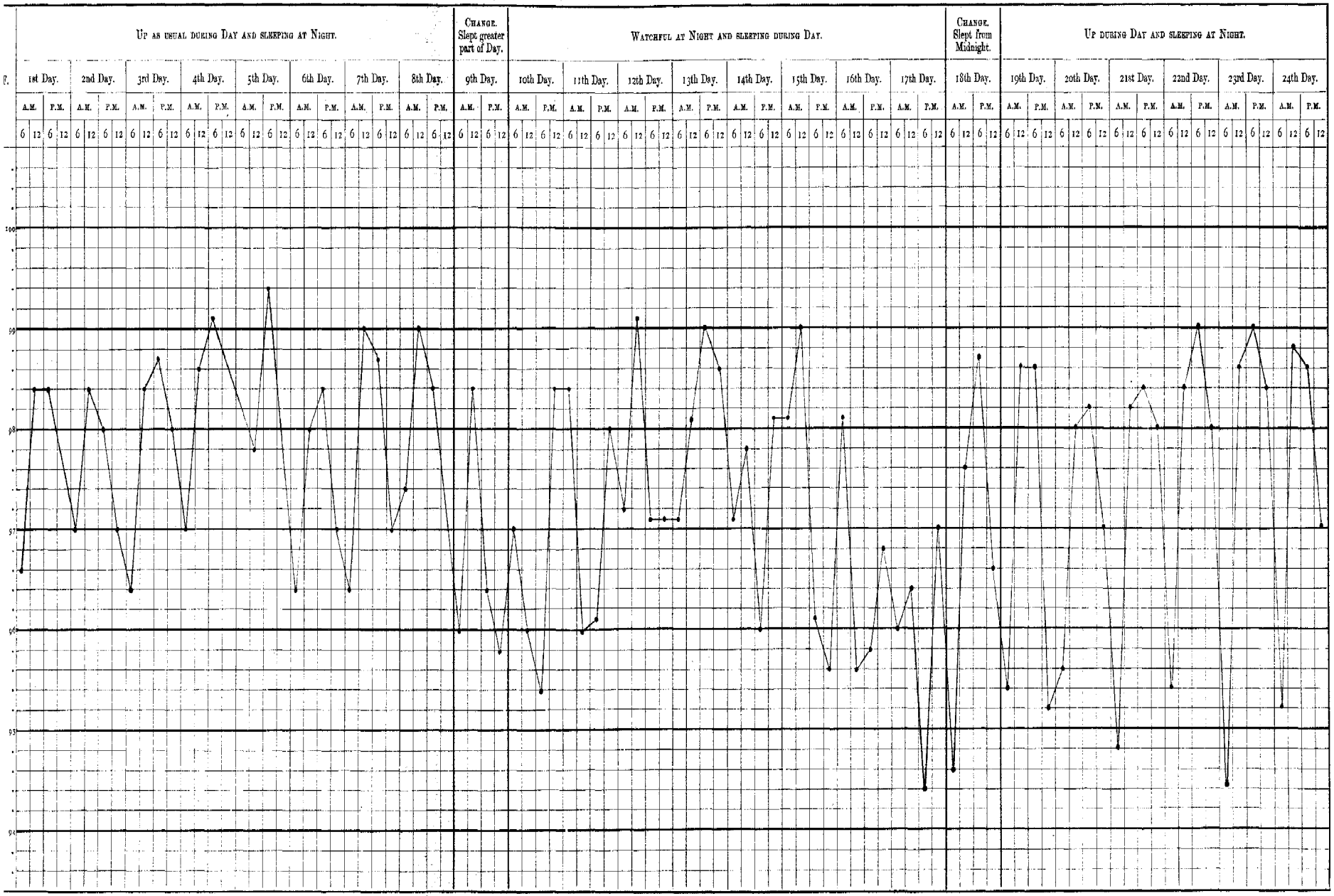
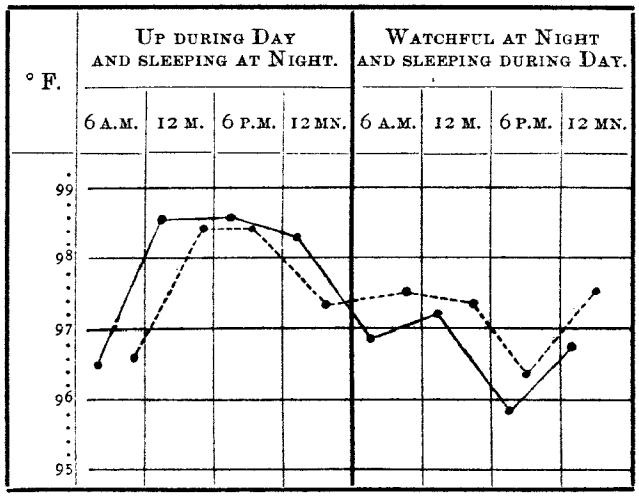


TABLE No. 5.—CHART showing MEAN TEMPERATURES for a Period of 24 Days, from H. M. and A. M., æt. 12 and 11 Years respectively; also reversal of Morning and Evening Records with Change of Habits.

(H. M.'s curve, ———; A. M.'s curve, - - - -)



Accepting this as evidence of so much heat generated, we may expect to find the nocturnal manifestation of the latter lower by just that proportion of constant difference, even though other circumstances were artificially assimilated to those of diurnal occurrence. This does not account, however, for some extremely low indications given by night and day, and especially during the latter time, in both children. Thus with H. M. 96° was registered during the daytime, and with A. M. 96°.20. In H. M.'s record we also find 96°.40, 96°.80, and in A. M.'s the same. On the day the habit was changed, during which they slept as much as possible, H. M.'s lowest record was 95°.20 and A. M.'s 95°.80. In the nights, while wakeful, H. M. and A. M.'s lowest was 94°.40 on the same night and at the same hour—17th day. H. M. during this time also recorded 95° twice, 95°.20 three times, 95°.60, 95°.80 twice; and A. M. 95°.40, 95°.60 twice, besides other abnormally low readings. On the day of change to the normal routine, A. M.'s lowest was 94°.60; H. M.'s, 94°.20.

On getting back to night rest H. M. had 94°.20 once and 94°.80 twice, besides 95°.20 and 95°.60, 96°.20 at other times. A. M.'s lowest was 94°.40, then 94°.80, 95°.40 twice, 95°.20 three times and 95°.60 at other times.

These low temperatures no less surprised than alarmed me at first, but I could detect nothing to warrant anxiety. The children are strong, well-developed and well-nourished. They appeared then to be and have since been in perfect health, eat well, are active and lively, and complained of no subjective sensations in keeping with the mercurial indications.

On every occasion these observations were taken with three different instruments, one of which had the Kew correction.

Dr. AITKEN* states that Mr. JAMES P. CASSELS of Glasgow was much struck while using the thermometer on children completely recovered from measles by the low records he got; and in a table of temperatures taken from a child 16½ months old "*when asleep* and every source of error carefully avoided," he shows results "*below* those of adult life." He took six records as follows: "96°.2 F., 96°.4 F., 96°.4 F., 97°.2 F., 97°.6 F., 97°.4 F."

I have a strong impression of having noticed in some of the medical publications communications calling attention to this peculiarity in children, but cannot at the moment recall when or where; at any rate, it is a fact well worth bearing in mind, and may save much of the anxiety likely to arise if only discovered at the bedside by one unprepared for such results.

Now looking to our immediate object, we know that the variations in temperature are primarily due to chemical changes going on in the body, and may be at present considered only in so far as these concern the access of oxygen and production or exhalation of carbonic acid. These, at any rate, are undoubtedly the chief differences found between the conditions of the blood at the two periods under review.

Turning to the embryo filaria we find that an anxiety to possess itself of oxygen seems to be a very conspicuous and constant trait in its disposition. Thus it will be remembered that on the slide, if the animal happens to get washed away from the bulk of the red corpuscles, it becomes most restless, at once stretching out its body as though seeking for something; on coming in contact with the globules, it eagerly embraces them, rolling these over and around its body, and if washed back to the general mass these motions continue for some time. After a little, however, as if it had recovered some of the vitality lost during removal from corpuscular contact, it resumes its vigorous movements and the semi-oval form that seems to be its normal and healthy position. Again, the embryo leaves the human circulation and enters the mosquito prior to the blood of its primary host undergoing the changes which, it is suggested, bring about its death. Now in the mosquito the condition certainly changes, but in a direction apparently favourable to development, and which the instinctive desire of the parasite seems to indicate,—that is, the continued and regular supply of oxygen is secured. Thus, we may put it, the embryo having stayed as long as is compatible with its safety and comfort in the human host, changes its abode for one where these essentials approximate to, or exceed, those present in man's blood during the night.

Even here, it would seem, the embryos manifest an elective ability, selecting a position where the most oxygen is available and where there is less exposure to the products of oxidation; for, as LEWIS has pointed out, the imbibed filariæ soon emigrate from the abdomen of the mosquito to its thorax. Dr. MANSON fully confirms this statement.

Considering the circulatory structure of insecta, we find that the dorsal vessel or rudimentary heart discharges its contents into the neighbourhood of the head, and so those filariæ situated high up in the body are being constantly bathed by a fluid richly charged with oxygen. True, if lying in the abdominal cavity they are not deprived of this gas, for the tracheæ or spiracles would no doubt keep them more or less supplied; but, for obvious

* *Practice of Medicine*, 6th ed., vol. i, 247.

reasons, the conditions of the thoracic position are superior, and calculated to afford all that is required for sustenance and development in more concentrated and convenient form. At least this seems to me a probable explanation of this selective tendency in the parasite, while I think it proves the constant need for and seeking after oxygen, a point more specially under notice at present. I take the following from CARPENTER'S *Physiology*, 7th edition, page 343, where, referring to the varying amounts of carbonic acid exhaled during day and night, he says:—

Sleep or Watchfulness.—The amount of carbonic acid exhaled during sleep is considerably less than that set free in the waking state. This is particularly shown by the experiments of SCHARLING. . . . . Thus in one case the hourly exhalation sank from 160 to 100, and in another from 194.7 to 122.3.

On page 344:—

From the experiments of SCHARLING on the human subject it would appear that the average proportion exhaled by day to that exhaled by night is as $1\frac{1}{4}$ to 1; and this difference does not seem to be affected by sleep or wakefulness. . . . . There was the least during the middle hours of the night, a slight increase with sunlight, a large increase after the meals, and a decrease before them, and a prolonged and inevitable fall after about 9 o'clock P.M.

Compare this with the periods of filarial appearances in varying numbers and their withdrawal, when a very striking relationship seems indicated. On page 345 the author gives the result of PETTENKOFER and VOIT'S experiments on a healthy man, in the following table:—

PERIOD.	ELIMINATION THROUGH SKIN AND LUNGS OF		Amount of Oxygen absorbed.	Percentage of the inspired Oxygen in the Carbonic Acid.
	CO_2.	H_2O.		
	Grammes.	*Grammes.*		
Day (6 A.M. to 6 P.M.)	532.9	344.4	234.6	175
Night (6 P.M. to 6 A.M.)	378.6	483.8	474.3	58
TOTAL IN 24 HOURS	911.5	828.2	708.9	94
A few days later the same man worked till exhausted.				
Day	884.6	1,094.8	294.8	218
Night	399.6	947.3	659.7	44
TOTAL	1,284.2	2,042.1	954.5	98

He goes on to say, page 346:—

The table shows a remarkable excess of the diurnal against the nocturnal elimination of carbonic acid, especially after work, and a corresponding increase in the percentage of the absorbed oxygen which is thus discharged.

It is to be noted at present, therefore, that according to these authorities the amount of absorbed oxygen discharged during the night is as 58 to 175 of that eliminated as carbonic acid in the day for a man undergoing ordinary labour; while for the same man working hard, as most Asiatics do, the proportion is as 44 to 218. Allowing for the amount combining with hydrogen, the blood must still be markedly richer in free oxygen at night than during the day.

On page 223 (*op. cit.*) it is stated that SCZELKOW and BERNARD found that venous blood, returning from muscles at rest, contained on the average 6.71 per cent. *more* carbonic acid and 9 per cent. *less* oxygen than arterial blood; while from muscles in action the excess of carbonic acid was 10.79 per cent., and the deficit of oxygen 12 to 16 per cent. in venous blood, as compared with arterial. Considering these facts, it seemed to me possible that the embryos were killed by carbonic acid either acting as a direct poison, or, by excluding oxygen, bringing about the same result indirectly. To decide this question I naturally made observations on the effect produced by the direct application of carbonic acid to the blood, and in order to get a sufficient supply of the latter the median basilic vein was punctured. I was at once struck with the marked difference in vigour and vitality shown by the embryos in this blood as compared with those in a drop extracted from the finger at the same time by the ordinary method. Proceeding to test the longevity of the filariæ in each specimen of blood, two thoroughly oiled slides were rapidly applied to the puncture in the vein, so as to avoid as far as possible oxygenation taking place, and the cover quickly slipped on. These precautions were deemed advisable, as I observed that if the drop of venous blood was exposed for a little time to air the filariæ distinctly became brisker and exhibited something of their normal activity, though still comparing unfavourably with their fellows taken from the capillaries. The following are notes of the results obtained in January 1884:—

EXPERIMENT 1.—*Drop of Blood from Median Basilic Vein; Eight Embryos on Slide.*—Marked difference in vigour from those in blood drawn by prick from finger; all more or less feeble and stretched out. By the third day none were to be seen on slide, this being a somewhat quicker result than was got with the filariæ withdrawn from arterial circulation in the morning.* Those extracted in the usual way, from the finger, besides being much brisker from the first and preserving their vitality much longer, had not all disappeared from the slide until the morning of the ninth day.

EXPERIMENT 2.—Three ordinary soda-water bottles were taken, and about 1 oz. of venous blood allowed to flow into each.

Taking the mean of five slides also charged with some of this blood, I calculated that each minim contained about six filariæ, which would give for the whole quantity 8,640. Prior to covering the slides the drop was freely exposed to the air, with the effect of considerably reviving the otherwise debilitated embryos. These were put aside and examined daily, and by the fourth day all the filariæ on the different slides had disappeared.

To return to the bottles. No. 1 was placed under the gas pump, and well-washed carbonic acid was forced in at the ordinary pressure used for soda-water, viz., 8 atmospheres. No. 2 was similarly treated, save that the gas had a pressure of only 5 atmospheres; and with No. 3 the gas was merely allowed to flow in at a pressure of about 5 lb. on the square inch. This of course immediately produced on the blood the usual effects of contact with carbonic acid. The bottles were securely corked in the ordinary way by the machine and put aside for 12 hours. On opening the first and second, though several slides were examined from each, and the blood taken at different depths, I was only able to discover on one slide from No. 1 bottle the remains of three filariæ; from No. 2 I found two dead embryos on one slide and some remains on the others; with No. 3 I got, on one slide, five very feeble filariæ, on another three, and on a third four and remains of two others.

We must discard Nos. 1 and 2, as probably the great pressure at which the gas was forced in took the chief part in causing the death of the parasites, though I am of opinion that the carbonic

* *See* former paper, Customs *Medical Reports*, xxi, 17.

acid certainly hastened the solution; with No. 3 it is quite possible that the carbonic acid may have brought about the result, but I could not form any decided opinion from even this experiment as to whether the carbonic acid acted as a poison or merely destroyed life by the exclusion of oxygen.

As may be supposed, I had considerable difficulty in persuading To Ah to submit to an operation that appeared so formidable to one of a race who gauge the severity of all injuries by the amount of blood-flow. By dint of ample reward, however, and assurances that I had taken every means to convince myself of the harmlessness of the procedure, I got him for this occasion only to submit as I have described. This occurred 18 months ago, and I may mention that he is in perfect health, allowing me at intervals to tap his finger by needle-prick; still even for this he is by no means so complaisant as formerly.

I mention this so that the experiments, unrepeated as they were, may be taken for what they are worth; and indeed all through, the fact of being so heavily handicapped by being confined to one individual, the embryos in whom were palpably getting less numerous, renders all that I have done, of late years at least, and which are dependent on observations made with a solitary case, only valuable so far as what they seem to foreshadow may be borne out by investigations which must be much more extensive and searching before that scientific accuracy can be arrived at so essential to the deduction of positive conclusions.

The following appears to lend some support to the idea that in the presence of an excessive supply of oxygen the embryos are more indifferent to the action of carbonic acid:—

Experiment 3.—Through a drop of blood on a slide I passed a continuous current of carbonic acid for some considerable time. The cover-glass was then put on and the slide preserved in the usual way. I was not able to convince myself that the embryos were materially affected either during the time the gas was playing on them, or afterwards as to their longevity. I should state that the blood so acted on was arterial, and obtained from the cutaneous capillaries by acupuncture.

Experiment 4.—I next tried the effect of keeping the slides in an atmosphere of oxygen, and so marked was the effect apparent on the activity of the embryos and their longevity, increasing this $2\frac{1}{2}$ days beyond that previously observed, that I was led to attempt, by the following method, to see whether development could be artificially induced. Taking two test tubes sufficiently wide to admit slides narrowed for the purpose and charged with To Ah's arterial blood, I connected them by tubes with a pipe leading from the oxygen receiver. Turning on the tap, both test tubes were thus kept constantly filled with oxygen. I then placed them under a sitting hen. One test tube was reserved for occasional examination, a small tap being fitted to the tube by which it was connected with the main gas pipe, hoping that if any results showed themselves I might, after a suitable interval, be able to get these more matured in the unopened tube. At the first examination, however, I discovered that coagulation had proceeded to an extent incompatible with the existence of the filariæ; at least I thought to this was due the disaster which seemed general. No doubt the continued high temperature under the hen conduced to the speedy formation of clots.

In reference to this it is very necessary, in making experiments as to the longevity of the embryos and their solubility in the liquor sanguinis, as I pointed out in my former paper when referring to these, that both slide and cover-glass should be carefully oiled for about $\frac{1}{4}$ inch round the edge of the latter, when it will be found that this not only prevents desiccation but also seems to arrest coagulation. If unoiled slides are used, evaporation takes place very rapidly, clot forms, and the embryos, however vigorous, are very soon killed. Received into the stomach of the mosquito, the fluidity of the blood seems to be preserved all the time

it is in that organ. But the best instance of this is the leech, which, as is well known, retains the blood for several months in its stomach uncoagulated; this is doubtless due in great part to the contact with living tissue, affording no scope for liberation of the fibrinogenous ferment.

The following experiment lends force to the supposition that the absence of oxygen is the cause of embryo mortality:—

Experiment 5.—I took two slides (*a.* and *b.*) and charged them with blood from the finger. They were of course carefully oiled, and every precaution taken to ensure the safety of the embryos. Slide *a.* was found to contain five filariæ. Round all its edges was carefully painted a solution of Canada balsam in chloroform, the glass being so held as the application was made to each edge that risk of the vapour getting between the glasses was obviated or reduced to a minimum. When quite dry a solution of ordinary sealing-wax in alcohol was painted over in like manner, so as to hermetically seal the included fluid from the outer air. The embryos were immediately examined, to make sure that no injury had been done them, and they were found to present all the appearance of health and vigour. Not so, however, two hours afterwards, at which time examination showed them all to be feeble and stretched out; one was apparently dead. 12 hours afterwards not an embryo or even the remains of one was to be seen on the slide, though no signs of desiccation or coagulation were apparent, the blood globules rolling about freely on being shaken.

To make sure as to the vigour and general salubrity of the filariæ on slide *b.*, it was not sealed up until 12 hours after preparation, and prior to doing so it was carefully examined. The parasites were vigorous and presented the appearance common to healthy specimens. The same process was again carefully gone through, and immediately afterwards the slide was examined to discover the condition of the embryos, of which there were 10. Six hours afterwards only 7 were visible, all very feeble, and in 12 hours they had all disappeared. Slides simply oiled but unsealed, prepared at the same time as these, preserved the contained embryos for the usual period.

It may be that, in spite of all precautions and apparent success in prevention, the vapour of chloroform got in between the glasses and brought about the result, but I do not think this was so. However, the foregoing are the results of my observations, and, of course, require further and corroborative investigation by independent observers before the opinions I have adopted can be accepted generally.

Dr. SONSINO of Egypt states * of the filariæ seen in the urine of chylurious patients that generally, even if the examination is made soon after emission of the urine, the embryos appear dead, or if living, their movements are very slow. This is very different from that which he has verified in regard to filariæ in the fluid of lymphocele. He supposes that the ordinary acid urine is favourable to their vitality.

This might be thought to suggest the possibility of CO_2 being the cause of death, though of course here also the advocate for absent O may urge the deprivation theory.

In urine the tension of CO_2 is estimated at 68 mm., while that of venous blood is only put at 41 mm. of mercury.

It is a fact (*see* Experiments made to determine the effect of certain substances on the filariæ, recorded in my last paper †) that water added to the slide brings speedy death to the parasites; and it was suggested that this was probably due to rapid absorption of the

* *Transactions of the Epidemiological Society, London*, 1881–82, vol. 1, N.S., 151.

† Customs *Medical Reports*, xxi, 22.

fluid. Again, Dr. MANSON has stated that, provided the density is kept up to that of serum, the addition of fluid does not injure the embryos, and even recommends using urine to compensate for the evaporation which takes place when they are preserved in blood alone. He does not mention how long they lived after adding the urine, or whether it affected their vitality at all; but assuming it did not, this fact would seem to support the contention that CO_2 in the presence of O is innocuous. Red globules of course contain and continue to give out O for long after their withdrawal from the body; and in the confined area under a cover-glass, with the disproportionate quantity of urine it would be possible to insert, sufficient gas might be present to obviate disadvantages which in its absence would be disastrously predominant. In the present hypothetical state of the question I can do no more than call attention to established facts, suggest their possible bearing and leave it to each one to draw his own deductions.

To sum up, the following conclusions are those I submit as borne out by what I have described:—

1.—Accepting that parturition in the parent worm is continuous and excessively, prolific, then removal of those filariæ which have had their chance of mosquito withdrawal but have escaped selection, is necessary in view of the swarm which will inevitably enter the blood from the lymphatic system at the next period of its suitability for their reception.

2.—The marked difference between the condition of that fluid when favourable for filarial development and its state when hostile to their existence seems due either to the presence of an excessive amount of carbonic acid or to the absence of a sufficient quantity of free oxygen. The former necessarily involves the latter, and experiments seem to show *(a.)* that direct contact of carbonic acid in presence of excess of oxygen is not, immediately at least, injurious; that *(b.)* exclusion of oxygen, either directly, or by surrounding the blood with carbonic acid, brings about the destruction of the parasites; and that *(c.)* the behaviour of the filarial embryo, both in the human blood and when contained in the mosquito, indicates a desire for this gas. Consequently we may assume that not improbably the presence of oxygen is essential to further development, and its withdrawal or diminution in quantity conducive to death.

I would therefore suggest the following as the course pursued by the embryo from birth until its absorption by the mosquito. For a period of not less than 12 hours, and probably in no case exceeding 24, it remains in the lymphatic system. At some time during this period, urged by the favourable conditions in the hæmic circulation, it exhibits for the first time selective ability and enters the latter. It will be observed that, supposing 12 hours the least time apportioned for intra-lymphatic existence, and that the filariæ disappear from the blood at 7 A.M., appearing again at 7 P.M., those born between these hours will be ready for entrance into the blood at various times during the following night; but those born during the night itself would only be fitted for intra-vascular existence at some time during the day. This infers a longer or shorter delay, according to the hour of birth, and may account for the fact of embryos being occasionally seen in the blood during daylight, as was the case with all MANSON's early finds, got as these were during that period. It is possibly, however, more

or less the result of accident, due either to what we may call impulsive injudiciousness on the part of a few, or untoward subjection to the irresistible forces present at or near the termination of the thoracic duct, within the scope of which they have been tempted to approach too closely.

As to the facility for postponing their advent, shown by those embryos born during the night, we have actual proof of such capability on the part of the parasite in those geographical results I have previously described. For, taking the case of the man from India, the embryos seen in that country and those visible in England being presumably from the same parent, and her parturitive routine, we must suppose, remaining unaltered, those of the young which would have appeared at 7 P.M. in the East must have been able to defer their début for over 5 hours when the man arrived in London, and applying this same reasoning to the hypothetical Fijian, we come at 12 hours as probably the extreme limit of restraint. I need scarcely point out that the term "postponement" is only used in a figurative sense, implying that the products of certain hours that appeared at 7 P.M. in India would, if keeping to the same arrangements, appear five hours too soon in the blood in London, and, of course, compliance with the necessities of travel is really only an adjustment in sequence.

Although, as before pointed out, I believe the embryos wanting in locomotive power at this stage, still there can be no doubt of their ability to resist moderate onward pressure, either by actual adhesion, which, however, I do not think very probable, or, as is more likely, by the opposition of forces resident in the parasite, which, converging towards a central point, are able to control, within certain limits, the duration of stay in the sluggish lymph current. When the proper time arrives, however, the embryos yield to the flow, and their passage to the now attractive blood is brought about. Note that in the mosquito, where migration has to be effected in a stagnant medium, inherent locomotive powers are required; so at or about the end of another 24 hours—observe the coincidence in duration of period—the embryo temporarily becomes possessed of this ability, moving about freely. Arriving at the thorax and beginning a stage where quiescence is more conformable to its necessities, the parasite seems again to enter on a sort of chrysalis state, or, in other words, to become passive.*

To briefly summarise the above:—As the result of continuous parturition in the parent, the embryos pass a certain term of existence in the fluid on which, when matured, they will depend for sustenance. Emerging from this, their next environment is one where the essentials for development are amply provided. The mosquito then intervenes, and once more conditions suitable to filarial requirements are afforded; and, lastly, at maturity the parasites find themselves deposited in a position most favourable for transport to their future and permanent habitat. Thus all the embryonic stages are passed in different media and under varying conditions. From the very outset the young embryo, as it is launched on the first important phase of its career, is made to enter the blood at a point whence it may be most speedily in contact with that which is so essential to its vitality and growth. Free of the thoracic duct, rapidly floated through subclavian vein and heart, it quickly reaches the lung, where oxygen in abundance refreshes and strengthens it prior to starting on the circuit whence insect

* MANSON, Customs *Medical Reports*, xiv, 12.

delivery becomes possible. Failing to secure this, and returned exhausted, once more the invigorating process is undergone, and so on until the time arrives when the competition is decided, and room has to be made for the eager throng that in turn must be afforded a chance,—nay, are even then preparing for the coming of night with its opportunities. The rejected must go. The choice for survival has been finally made. This is accomplished by no sudden or irregular convulsion, but by the quiet and orderly necessities of another and greater economy. A change takes place; the nurturing host becomes the ruthless destroyer; the equilibrium of nature is preserved, and she pursues the even tenor of her routine. The harmony of the whole conduces to the excellence of its parts.

ELEPHANTIASIS.

I now come to discuss the bearing filaria sanguinis hominis has on elephantiasis. But before entering fully on this, a preliminary consideration of the leading characteristics of the disease may facilitate further inquiry. Sir JOSEPH FAYRER, both before the Pathological Society in February 1879,* and in a lecture,† states his belief that elephantiasis is a disease peculiar to tropical climates, and distinct from those affections met with elsewhere, which present, however, somewhat similar appearances.

Dr. STEPHEN MACKENZIE, on the other hand, thinks that no definite line can be drawn between dermatitis and elephantiasis Arabum, and, in fact, that it is only a question of degree. Mr. JONATHAN HUTCHISON,‡ in a lecture delivered at the London Hospital, while clearly differentiating this form of enlargement from other morbid conditions in which increase of size forms the most prominent feature, sums up his description with the following graphic statement. (The italics are mine.)

> *Inflammatory disturbance of nutrition is the starting point.* The tissues are flooded with serum, and owing to their dependent position—scrotum, labium or leg—this serum has difficulty as to its reabsorption. The cells of the part already in a state of excitement feed on it, and irregular modes of growth are the result. You might obtain a somewhat parallel phenomenon if to any given village unlimited supplies of beef and beer were weekly consigned for gratuitous distribution.

From the various general and minute investigations made by pathologists at different times, the chief morbid changes may be summarised as follows:—Epidermis thickened; enlarged papillæ; dermis enormously thickened, and its tissue looking as if infiltrated with a clear fluid; hypertrophy of subcutaneous connective tissue, due to increased cell proliferation, which latter state VANDYKE CARTER says may extend as far as the periosteum; dilatation of the lymphatics, extending (according to the same authority) as far as the thoracic duct; sweat-gland ducts elongated; blood-vessels numerous and enlarged; nerve connective tissue thickened.§ CORNIL, in a special and extended examination, particularly mentions finding the lymphatic glands in a state of chronic inflammation.‖

* *Lancet*, 1879, i, 267.
† *Ibid.*, 1879, i, 433.
‡ *Ibid.*, 1876, ii, 282.
§ *Ibid.*, 1880, i, 565.
‖ *Ibid.*, 1883, ii, 554.

The foregoing appears to be a fair *résumé* of the pathological points on which all observers agree, and which my own investigations, so far as they go, certainly support. Although, as far as I can discover, Sir JOSEPH FAYRER stands alone in the supposition that the elephantiasis Arabum of tropical or sub-tropical countries differs essentially from that condition which has been described and asserted to be by so many observers the same, though occurring beyond the sphere defined by him,* still, any opinion coming from this distinguished Indian surgeon, with his vast experience, deservedly carries great weight, even in the face of testimony from witnesses whose number and exceptionally high standing would otherwise render their evidence incontestable. Referring to some of these I find Mr. JONATHAN HUTCHISON, in the lecture previously quoted, enters minutely into the pathology, expressing a strong opinion and giving illustrative cases. The cases of Mr. BRYANT,† Mr. HOLMES, Mr. ALCOCK, Mr. CARR JACKSON, Dr. STEPHEN MACKENZIE, and Dr. CROCKER‡ and Dr. STRANGE§ are distinctly described as elephantiasis Arabum occurring in the United Kingdom, in subjects who, I gather from the absence of any statement to the contrary in some instances and direct assertion of the fact in others, were natives of Great Britain and always resident there. Again, before the Pathological Society of London,‖ in a discussion raised on some cases shown by Sir JOSEPH FAYRER, with special reference to their filarial origin, Dr. TILBURY FOX alluded to cases occurring in the United Kingdom, and stated that "the anatomical changes of the skin in the (Indian) cases described agreed with those he had himself observed."

The foregoing are all cases of elephantiasis of the lower extremity. The following is, however, I imagine, a very typical case of elephantiasis scroti, arising and treated in England. Mr. BICKERSTETH, of Liverpool, who reports it,¶ styles it "a large scrotal tumour," laying special stress on the fact of there being a fibro-cartilaginous growth embedded in a mass of hypertrophied skin and subcutaneous tissue, attached by a tough fibrous material to the upper part of the scrotum towards the position of the left external ring. It would appear also from the history given by the patient that a growth commenced in the groin, and afterwards becoming detached slipped down into the scrotal sac. For some time it remained freely movable, the patient being able to slip it up and down from groin to scrotum. Gradually, however, becoming fixed in the scrotum it slowly increased in size, and would seem to have excited the morbid condition with which I am specially concerned at present.

At a further stage of this inquiry I shall again have occasion to refer to this case as one supporting, if not confirming, the theory as to the hypertrophic lesion being a consequence of an excitant which may assume any form, and which under favouring circumstances can induce tissue changes, bringing about a condition not necessarily confined to any one locality

* In ESMARCH and KULENKAMPFF'S monumental work (*Die Elephantiastischen Formen*. Hamburg: RICHTER, 1885) the distinction between tropical and extra-tropical elephantiasis is stated simply in the form that one is endemic and the other sporadic. HUETER (*Deut. Ges. f. Chirg., Dritter Congress*, quoted by E. and K.) asserts that in Pomerania, Mecklenburg and West Prussia the disease is to a certain extent endemic. Wherever it is encountered the tissue changes are identical.

† *Proceedings of Royal Medico-Chirurgical Society*, 1866; *Lancet*, 1874, ii, 586.

‡ *Lancet*, 1880, ii, 619.

§ *Ibid.*, 1883, i, 411.

‖ *Ibid.*, 1879, i, 268.

¶ *Ibid.*, 1871, ii, 187.

or race by anything specific in the ensuing disease itself. Mr. BICKERSTETH reports on the mass, after removal, as follows:—

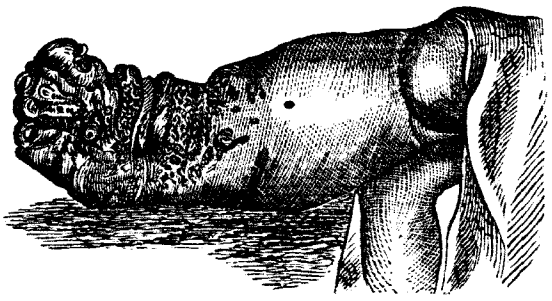
> The greater bulk of it consisted of hypertrophied scrotal skin and subcutaneous tissue, the latter so infiltrated with serum as to present an almost jelly-like appearance. Embedded in this was the original growth, about the size of a 32 lb. shot, enclosed in a firm capsule and presenting on section all the appearance of a fibro-cartilaginous tumour. Subsequent microscopic examination showed this to be its true structure. From its upper part a firm band had passed upwards, which was divided in the course of the operation.

This speaks for itself as to the pathology, and needs no comment from me. I may mention, however, as a further coincidence that a tough, semi-gelatinous mass is often found extending from the testicles high up in the scrotum to the lowest part of the latter.

Dr. MANSON,* when describing his operation for scrotal amputation, specially notices this; and I remember, on the only occasion when I saw him operate on such a case, a band similar to that described by Mr. BICKERSTETH passed up to a position so suspicious as to cause Dr. MANSON to hesitate, while we held a brief consultation touching the possibility of its connexion with a hernial sac. This structure may be merely the hypertrophied remains of the gubernaculum thus rendered conspicuous.

FAIRLIE CLARKE, in his *Manual of Surgery*, mentions having seen an elephantiasis of the scrotum which, when removed by Mr. WIBLIN of Southampton, weighed nearly 30 lb.; also one removed by Sir WILLIAM FERGUSSON from a bricklayer who had never been out of England, and who attributed the commencement of his disease to a blow.

Then there is LISTON'S celebrated case; while, with reference to elephantiasis of the leg, the same author (F. CLARKE) quotes Dr. C. J. RICHARDSON'S case of a young woman, who also had never been out of England. The illustration, copied here, accentuates this latter as a



typical one. No doubt there are several others available to one with greater means of reference at his disposal than I have, but perhaps these may suffice to show that true elephantiasis occurs in temperate climates, though much more rarely than in the tropics.

Again, on more critical examination of the two sides, as represented by Sir JOSEPH FAYRER on the one hand and the European authorities on the other, the difference may be found less irreconcilable than at first sight appears, or it is at any rate susceptible of more satisfactory explanation.

* Customs *Medical Reports*, iii, 28.

Thus, assuming hypertrophy to be a condition set up by the presence of some excitant, without reference to the geographical location of the subject, one can see how, supposing in any given area exciting causes were more abundant, and climatic influences favoured the tendency in the tissues to respond to the stimulus, in these districts or countries the number of persons affected would undoubtedly be greater than in places where irritants were less common and the tissues less inclined by hereditary or climatic influences to resent their presence. Hence, although the disease must be spoken of as endemic in the one and sporadic in the other part of the world, this qualification is only governed by the prevalence of exciting causes peculiar to given localities, while the consequences are pathologically the same everywhere.

Reflecting for a moment on the manner by which plasma exchange takes place between the blood and tissues in the normal state, one is reminded of the fact that, strictly speaking, the only difference between this process and that obtaining after a morbid condition has been induced (inflammation) is one of degree, the results varying in direct ratio to the activity of the stimuli calling them forth. From the demand made by a part in its healthy function, through increased exercise of this, or irritation short of exciting inflammation (PAGET,) to extreme disorganisation of nutrition, ending in molecular disintegration and death, we find the same principle in action. Then, working back from this last state we see resolution progressing stage by stage until the normal equilibrium between tissue want and lymph supply has been re-established. In other words, it would seem we arrive at a relation between hypertrophy and inflammation *vis-à-vis* the original stimulus that is in great part dependent on the amount of vigour or permanency of the latter, affected to some extent by induced or existent regional susceptibility. Hypertrophy, standing, as Sir JAMES PAGET shows, on the neutral ground between healthy function and inflammatory action, can, we may suppose, assume proportions bringing it so close to the latter state as to render definition of a distinct boundary line in all portions of the affected region difficult; or perchance the state itself induces concomitant changes which may be more properly included under inflammation; and this, if so, would account for certain seeming variations from the typical pathological appearances common to elephantiasis wherever met. Admitting, then, that the primary cause of elephantiasis is some kind of excitant, one can readily surmise how completely the mature filarial parasite might come to fulfil this *rôle*, though not perhaps at once or even at all, if taking up a position remote from sensitive surroundings, such as in a large lymphatic. Even if fixed beyond this system, it may well be that a solitary filaria could be accommodated and bring forth its offspring without materially affecting the normal equilibrium.

If, however, for any reason the parent worm took on a morbid state,—such, for instance, as would be shown by its premature discharge of the embryos,—then, by reason of this, coupled with the abnormal condition of the progeny, it is possible that the amount of subdued excitement necessary for producing hypertrophic changes may be readily afforded; or if the parasites are numerous—and how easily this may be brought about we can imagine when remembering that the subject himself is an ever-prolific centre of transmission,—the peculiar frequency of the disease in these localities, as compared with other places not so qualified, can be accounted for.

That hereditary influences have marked effect in favouring the result under discussion is verified by the experience of most observers; but I will only allude at present to that of Mr. BRYANT, who quoted to the Medical Society * the case of two lads, sons of a West Indian but brought up in England, who developed elephantiasis while there. The same gentleman (*loc. cit.*) further stated that he knew of a case in Leicester where the disease had been transmitted through three generations, none of the patients having ever left the town.

Race susceptibility is frequently described as another predisposing factor. No doubt people indigenous to certain regions where external exciting causes are common, acquire the disease and transmit a proclivity to their posterity while resident in that part. But if large numbers of the same race be transported to countries where these primary causes are rare, after a few generations they do not seem to afford more instances of disease than do the natives of their adopted land. This is the fact with African negroes settled in the United States. Some may therefore think hereditary tendencies acting through several generations subjected to continued risk will more correctly cover what, *primâ facie* and under certain circumstances, might seem to be characteristic of special peoples.

With reference to the liability of any form of irritation to set up elephantiasis, I would refer to the following as strongly tending to support this hypothesis, all being cases where the existence of emboli or other obstructions to lymph-flow cannot be suggested as inducing the state referred to:—

Mr. ALCOCK'S case originated from a dog-bite, the enlargement beginning as soon as the wound had healed. CARR JACKSON'S case commenced with abscess in the lower part of the belly.

These occurred in England. From Bengal † Dr. HAMILTON reports a case that commenced from a tulwar cut received below the knee. Even by my theory this of course may in that country have been merely the final stimulus needed to complete the action which other causes would eventually have brought about unaided.

STEPHEN MACKENZIE ‡ reported a case from Ireland to the Clinical Society of London, which began 10 years previously with an injury to the leg, and stated that he had been informed by Mr. BARKER that cases of elephantiasis were not so rare in Ireland as in England.

Dr. DOWSE, at the same meeting, also mentioned a case of his, due to syphilitic infection.

Dr. HEATH STRANGE § showed the Medical Society of London a remarkable case of elephantiasis of the thigh, apparently consequent on vaccination.

Mr. FRANCIS MASON, the president of the society (*loc. cit.*), also alluded to a similar case under his care; and in still stronger corroboration, Dr. ROUTH (*loc. cit.*) not only stated that he believed it possible to produce the disease artificially, but mentioned having actually seen this done by amyl nitrite accidentally introduced in an injection of morphia.

* *Lancet*, 1883, i, 411.
† *Ibid.*, 1879, ii, 649.
‡ *Ibid.*, 1880, ii, 619.
§ *Ibid.*, 1883, i, 411.

Mr. JONATHAN HUTCHISON * states as follows:—

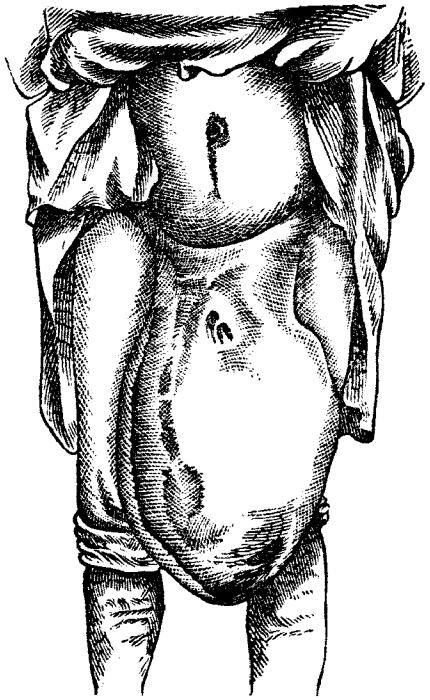
In English practice we meet with the two varieties (nævoid and smooth). In most cases the tuberculated form of elephantiasis takes its origin from some local injury or local source of inflammation, an ulcer on the leg, an attack of eczema, or, on the genitals, venereal sores may be its starting point. The smooth form, however, begins usually without such cause, and is often set up by a form of inflammation somewhat resembling erysipelas. . . . . We have in both forms of elephantiasis a very interesting illustration of the results of over-feeding of tissues.

Referring back to Mr. BICKERSTETH'S case, the following quotation from that gentleman's report may be thought pertinent to the question immediately before us. The patient's

Statement with regard to the scrotal tumour of which he was the subject was that 17 years previously he noticed there was a small lump about the size of a bean in his left groin, situated near the lower end of Poupart's ligament.

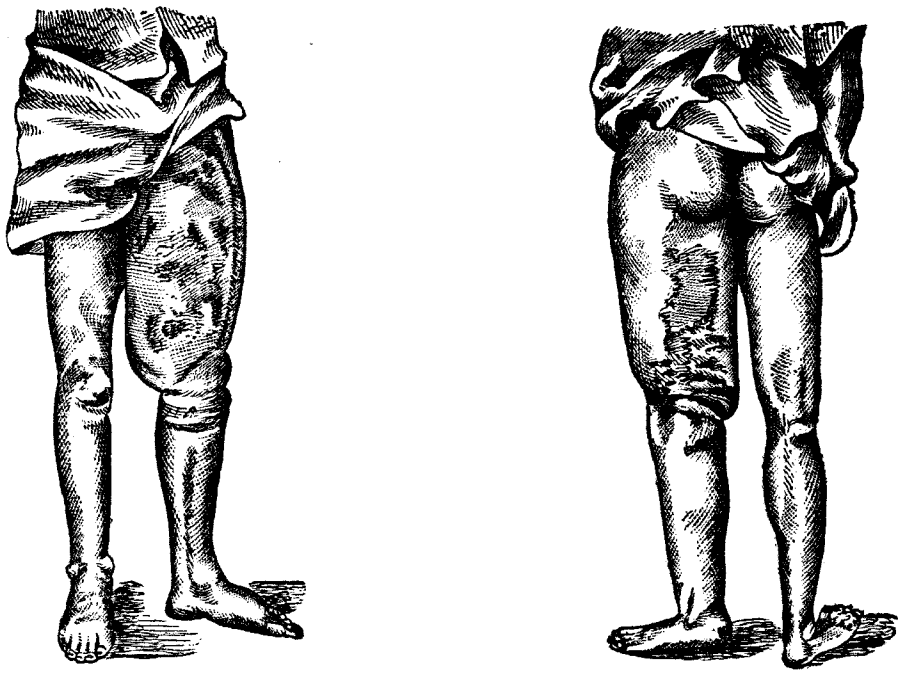
One day after retching violently and

While straining in the act of vomiting, he felt this lump slip down into the scrotum. For quite 12 months after this occurrence the lump remained movable, so that he could slip it up into the groin again at pleasure. Gradually, however, it became fixed in the scrotum and slowly increased in size, dragging down with it the left testicle to a lower level than the right one. For the first seven years or so the tumour slowly but steadily grew till it was about the size of two fists, not causing any pain, but after that time it grew more rapidly and soon doubled its size. As the tumour grew so the scrotal integuments and structures beneath all took on a hypertrophic action and also increased in bulk. Finally the tumour and its hypertrophied covering attained the enormous size represented in the woodcut.



ELEPHANTIASIS SCROTI, after BICKERSTETH. (*Lancet*, 1871, ii, 187.)

* *Lancet*, 1876, ii, 282.



ELEPHANTIASIS OF THIGH, after CARR JACKSON.

If the above be accepted as conclusive of the proposition, then we can see how the filaria sanguinis hominis might very frequently, through some untoward disturbance to its possibly otherwise harmless existence, become a fruitful source of elephantiasis; while at the same time, though to a lesser extent, because of their comparative rarity, other causes perfectly different in themselves might, in places remote from those where this parasite is found, produce exactly the same pathological results. No doubt the filaria is a very potent and indeed somewhat general source of mischief; for Dr. BANCROFT told the Medical Society of London that he could give a list of 30 different diseases connected with filariæ, while he also added that, having examined many cases of elephantiasis (presumably, in some instances at least, post-mortem), no filariæ were to be found.

Sir JOSEPH FAYRER, therefore, may be quite justified in saying that the endemic elephantiasis of India, set up by purely local excitants and fostered by climatic influence and predisposition, is something which as regards primary cause and intensity of effect differs from the same disease occurring elsewhere, and may be amenable to treatment. On the other hand, those who accept elephantiasis *per se* as pathologically the same everywhere are justified to the full extent of their assertion. That filariæ sanguinis hominis do take a preponderating share in the causation of elephantiasis and allied diseases in many countries I scarcely think can be denied; indeed, it is probable that in places where other causes are now suspected or accepted, examination may yet prove filaria sanguinis hominis the chief offender. Yet even in districts

like Amoy, where 1 in 10 of the people are infested, I should not be surprised to hear of an occasional case of elephantiasis where the closest examination, both ante and post mortem, should not only fail to discover the parasite, but favour the supposition of another and quite different origin.

Although I have generally confined myself to the use of the term elephantiasis, if the views I suggest of that disease be deemed satisfactory, lymph discharge, whether from the surface of the skin, such as in "milk scrotum," or into the urinary tract (chyluria), would seem to be accidents of the main disease which, when they occur, by providing an outlet for the superfluous lymph, deprive the tissue elements of the opportunity for undue voracity, and thus arrest or modify the hypertrophic changes that we observe in parts deficient in such relief. This may also account for the comparative rarity with which elephantiasis is associated with lymph-discharging phenomena.

In the cases where the two are combined it is perhaps not too much to assume that the external flow has been established at some period subsequent to the hypertrophy or perhaps in the course of its progress, when we may expect, and as a fact do find, the growth, if not actually checked, so considerably modified as to lead to a reasonable suspicion of an intimate relation between the two manifestations.

Mr. CARR JACKSON, when referring to his case, states as follows:—

> The tortuous lymphatics occasionally burst naturally and discharged freely. The boy states that he has collected pints of it. The limb has evidently decreased in size since the lymphatics came to the surface and have disgorged their contents from time to time.

With chyluria no doubt the ready exit offered to the discharge by comparatively unprotected and tender vessels affords an early means of arresting a condition which if set up in those regions would be fraught with much graver consequences than follow hypertrophy of less vitally important parts. It would seem as though these phases of the disease were natural efforts to avert results that would ensue if all the lymph exuded was available for tissue consumption.

In strong confirmation of the belief that lymph scrotum and chyluria are only phases of one disease, I would refer to Dr. MANSON'S book,* in which he proves by clinical evidence and characteristically concise reasoning the common origin of these diseases with elephantiasis. This allusion to that able observer and indefatigable worker naturally leads me to the consideration of his theories as to the part filaria sanguinis hominis plays in the causation of elephantiasis and allied diseases.

Briefly, Dr. MANSON suggests that the primary cause of the disease is obstruction in the lymphatic glands, plugged as they become by the premature discharge of immature filariæ confined in the unstretched chorion, thus forming, together with the enclosed organism, an ovate body considerably larger than the full-term embryo. Five times larger than a lymph corpuscle, these gradually plug the afferent vessels in the main lymphatic glands, obstructing lymph-flow and leading to the lesions indicated.

* *Filaria Sanguinis Hominis.* London: H. K. LEWIS, 1883.

If this view be accepted, we must assume that elephantiasis and its allies are secondary to lymphatic obstruction, *i.e.*, result from a mechanical in contradistinction to an organic cause; but this would seem to be more correctly applicable to a less chronic condition. And although, in view of the valves in the vessels, it does not seem easy to agree with Dr. MANSON'S theory as to "regurgitation" being the cause of lymph diffusion in elephantiasis, one could see how, if from any cause the lymphatics were obstructed in any portion of their continuity, the pressure from behind would rapidly fill and distend the inter-valvular portions of the tube, giving to the whole that cord-like, knotted feeling pathognomonic of œdema following interference with lymph-flow. But this condition is notoriously absent in elephantiasis; on the contrary, all observers agree that although the lymphatic coats are hypertrophied, the lumen of the vessel is uniformly enlarged. Indeed, Dr. MANSON himself pointedly calls attention to this fact in more than one instance.

Of course, if, as a consequence of the continued and increasing incitement, the vessels are unable to remove the plasma as fast as it is exuded, accumulation takes place in the affected part, and the sodden state described by pathologists is produced. But this would then be due to the proportional inequality between the outpour of lymph and its on-flow, though this latter may be even hastened, and actually passing through tubes capable of conveying abnormally large quantities. This would also account for the tissue saturation being localised in the neighbouring parts, in some instances in apparent defiance of gravity.

Mr. J. HUTCHISON, in his lecture before quoted, distinctly defines the difference between œdema primarily due to lymphatic obstruction and that concomitant with tissue overgrowth. For instance, when speaking of the former he says*:—

> In lymphatic cases the disease is almost always non-symmetrical. We may note also as a curious fact that very commonly no enlargement of the lymphatic *glands* occurs. I should be inclined to suspect this cause—obstruction of lymph—in any case in which the œdema was strictly local and abruptly limited, there being no evidence of disease of the veins or of mechanical pressure. I should consider my diagnosis confirmed if the œdema cleared off without leaving any dilatation of superficial veins; and during the progress of the case I should repeatedly and carefully examine the limb in order to ascertain if any little lines like whipcord could be felt under it. . . . . Indeed, it is not unlikely that primary disease of the lymphatics is extremely rare, and that almost always it is secondary to inflammation of the skin and subcutaneous tissues.

Then passing to his seventh group, elephantiasis, he says:—

> There is also overgrowth. And here we establish the line of demarcation between elephantiasis and all other varieties of persistent œdema. Prove that the tissues have become hypertrophied, that they are not only sodden with serum but that they are overgrown, and you prove the right of the malady to the title of elephantoid. . . . . Size ought never to be made a basis for classification; and between the conditions of chronic thickening of skin with solid œdema and papillary growth, which are not at all uncommon in our out-patient rooms, and the most hideous example of Barbadoes leg which you could find in the West Indian islands, there is no distinction excepting that of degree; the pathological process is precisely the same in both.

What chiefly concerns me at present in the above quotation is the support given to the view that primary affections of the lymphatics are extremely rare, and that when they do

* *Lancet*, 1876, ii, 282.

occur a condition is set up not only failing to agree with but distinctly differing from that which obtains in elephantiasis. Assuming this point unsettled, however, there seem to me to be other and very important difficulties in the way of Dr. MANSON'S hypothesis. If we imagine the parent worm situated, say, somewhere in the thigh, and that she miscarries, the ova being conveyed to the afferent vessels in the capsule of the inguinal gland—here suppose the ova to be distributed over the capillary plexus, and, *seriatim*, plugging them,—then as far as that gland is concerned its functions would cease, and the process would be carried on until all its fellows were similarly blocked. We thus arrive at that condition of lymph stasis which Dr. MANSON assumes must be produced before the hypertrophy commences; but at the same time, if we admit this we must also grant that the circulation of lymph over the whole of the lower extremity is now stopped, and the continuity of an important, if not thoroughly understood, nutritive circuit has been suddenly broken. Thus one might expect the functions of the whole economy to be seriously affected, supposing lymph return essential to the completeness of the general nutritive system; and this would certainly appear to hold good of the region so suddenly debarred from taking that donative part which to a great extent modifies the effect of deficit in the general store consequent on its primary demands. Hence, though an obstruction in the lymph-vessels, strictly circumscribed in its effects, might for a time be borne, so soon as this lesion involved a large area and comprehended a duration approaching the chronic, changes more marked than mere local hypertrophy would be induced, and the system as a whole would speedily exhibit consequences very different from those present in even the most advanced cases of elephantiasis.

I do not understand Dr. MANSON to mean, nor does it seem consistent with his theory to suppose, that anything short of complete and nearly simultaneous occlusion takes place prior to the hypertrophic manifestation. If it be suggested that after the occlusion of the glands of one side lymph return can still go on by the anastomoses with the lymphatics of the other, it must be remembered that the ova could also pass in the same way, and plugging of the glands on both sides would eventually occur. In support of this I need only quote Dr. MANSON'S statement.* (The italics are mine.)

> Anastomoses for a time will aid the passage of lymph, but the anastomosing vessels *will carry the embolic ova as well as the lymph.* The corresponding glands will then, in their turn, be invaded, and so on until the entire lymphatic system connected directly or *indirectly* with the veins in which the parent worm is lodged becomes obstructed.

In fact, on the completeness of this stoppage, on the affected side at least, I gather Dr. MANSON holds the inception of the disease depends. If this be the case, how comes it that the affection is not generally distributed over the whole of the part or parts on the distal side of the glands? Thus, if a scrotum is elephantiased in consequence of the inguinal glands being obstructed, why are the limbs also not always affected? Or if the leg, as is generally the case, be the seat of disease, how comes it that very often the thigh is not only unaffected, but little or no signs of interference with the normal nutritive changes of that part are apparent?

* Customs *Medical Reports*, xxiii, 14.

Venous absorption would scarcely account for this. Dr. MANSON, in his work previously quoted, writes as follows concerning Case 20:—

> The integuments of the left thigh, over its inner, anterior and posterior surfaces, are distinctly elephantiased from the knee to a point about two-thirds up the thigh; the rest of the limb appears to be quite normal; but in the situation mentioned the skin is darker than that on the corresponding part of the other thigh.

And again:—

> It may be objected that the affection of the skin of the thigh in this case was not elephantiasis. If it was not this it is certainly a wonderful coincidence that his mother, who lived in the same house with him, exposed to the same chances of filarial infection, should develop true elephantiasis of the leg.

Not to multiply instances of partial elephantiasis, I will only refer to Mr. CARR JACKSON'S case (*see* woodcuts, page 29), wherein the thigh was affected, leaving the leg apparently sound; and here I might remark on the bearing such instances would have on arguments tending to support the hypothesis of lymph gravitation being the cause of overgrowth in the leg. It would also seem improbable that the general manifestation of disease was due to a gradually progressive occlusion of the glands; for supposing the ova capable of permanently plugging the capillaries, in such constant and practically unlimited numbers as the former are, the process would obviously be continued so long as the supply lasted, and until all the glands were stopped up.

How does the theory of occlusion agree with the structure and arrangement of the lymphatic system? We must remember that although the main vessels divide up into numerous smaller ones in the capsule of the gland, the central part of this organ I scarcely think can be described as "solid" in the sense I understand Dr. MANSON to use the term. Without doubt the cortical follicles and medullary cylinders consist of, comparatively speaking, dense adenoid pulp, round and outside of which the lymph filters on its way towards the efferent vessels, and it is here that the reticulum catches and detains pigment or other particles for disposal by the large amœboid lymph corpuscles wandering about in the lymph paths, devouring or disintegrating such extraneous matter; but I do not see how the arrest of these could there interfere with the circulation of the fluid past them. At any rate, if the gland be plugged on its distal side, no lymph, properly so called, ought to be found within the organ itself. It might be suggested that possibly the exploratory needle did not penetrate to the interior of the gland, getting no farther than the "varicose" capillaries in the capsule. But if this were so, disintegrated filarial envelopes, embryos and other *débris* of like nature could scarcely be looked for, seeing that these are changes proper to the gland itself, and not capable of being produced in the parts external to it.

Dr. MANSON and other observers repeatedly speak of withdrawing a quantity of "milky lymph" from the enlarged glands, while Dr. MANSON quotes case after case where he found "embryo filariæ in all stages of vigour" and "numbers of threads," which he himself suggests are the remains of the "collapsed sheath of the embryo, the body of which had disappeared by absorption or disintegration." As to the presence of filariæ in enlarged glands when none appear in the blood, I can personally testify. How these filariæ get into the gland if the passages thereto are all blocked, and not only in solitary or accidental instances but

in great numbers, seems a very formidable difficulty. If what I have previously stated is correct as to the solvent effect of lymph or liquor sanguinis on the debilitated embryo, then it would seem that, presuming the ovum even temporarily arrested in a capillary, before long the surrounding fluid, aided by the back pressure and the motion of the contained embryo, though not perhaps in every instance entirely disintegrating, would, at any rate, so modify the shape of, and it may be soften, the embolus as to allow its passage, at the same time injuring some of the embryos to the extent of causing their immediate death and subsequent solution in the gland; while others, more hardy, having stretched their envelopes, pass on in a condition less morbid, and so account for the varying stages of vitality exhibited by the filariæ found in fluid taken from enlarged glands. Besides, the constriction, if any, on the outside of the ovum, being doubtless similar to that which enables or aids the normal embryo to elongate its sheath prior to leaving the maternal canal, would most probably tend here also to favour a like condition, and thus facilitate a progress only temporarily interfered with by the globate form of the body as first presented. From injury or immaturity the embryos eventually perish in the gland, and this may account for their non-appearance in the blood in advanced cases of elephantiasis. It also seems reasonable to assume that with increased viciousness of habit which constant miscarriage sets up, the discharge takes place at progressively earlier stages of embryonic life, and the offspring are less and less capable of prolonged existence or resistance to intra-glandular influences.

Temporary inability of the parent to discharge young with the vitality necessary for withstanding the glandular influences may also account for the occasional absence of embryos in the blood, their reappearance being due to the recovery of the affected worm, or, it may be, of course, to the arrival of a new and healthy parent. Again, granting that the ova could plug an ordinary afferent capillary, it is fair to assume this must cease as soon as these tubes are dilated to an extent proportioned to that observed in the larger vessels.

VANDYKE CARTER tells us that this dilatation of the lymphatics extends as far as the thoracic duct. CORNIL,* though he found the glands in a state of chronic inflammation, does not mention or hint at embolism or varicosity of the capsular vessels, a condition one would surely have noticed when making the minute examination that eminent pathologist describes. Apart, however, from the fact of embryonic presence in the glands seeming to point to patency of its approaches, ought we not rather to expect a state of atrophy in an organ the functions and utility of which have been so completely interfered with? But then, could such a condition have escaped the notice of observers like VANDYKE CARTER, CORNIL and others who have had opportunities of making postmortem examinations? Or would such be consistent with the chronic glandular enlargement observed during life, and which CORNIL and others have shown to be due to inflammation of the connective tissue in this structure?

The foregoing are some of the chief difficulties arising in my mind when considering Dr. MANSON'S pathological views. I trust, however, that while attempting to define them I may not have appeared either dogmatic or hypercritical.

* *Lancet*, 1883, ii, 554.

Well aware of the immense difference there is between the labours of one who has to construct from most limited data and the comparatively facile task devolving on his critic, I am also fully conscious that in stating what follows, the position assumed is equally liable to adverse criticism. Whatever theories I advance are put forward with all the diffidence which the inadequate means at my command necessitate, and can merely, in the absence of more extended investigation, be taken as somewhat crude ideas, fortunate if useful in stimulating the attention of more favoured observers.

Assuming the primary cause of tissue overgrowth to be organic rather than mechanical in its origin,—that is to say, that the excess of lymph effusion is itself an intermediary consequence between the primary excitant and its most marked result,—I submit that whatever is capable of setting up increased plasmic flow, as distinguished from accumulation due to obstruction (being short of inflammatory effusion), whether it be the filaria sanguinis hominis, a wound, an ulcer or an eruption, provides the means for tempting cell voracity, and so produces all the manifestations at present under discussion; whereas the condition resulting from mere lymph stasis, due to a cause entailing suspension of an important circulatory function, would induce a morbid state, acute in its nature and not compatible with the sub-normal condition favouring hypertrophic changes. Suppose the filarial parent located in any given part; so long as it remained the sole invader of that region, it seems quite possible that the natural powers of adjustment might obviate any material disturbance of nutritive equilibrium. Though a demand for slightly excessive supply might be complied with, and no great disarrangement between the outcome of lymph and its natural removal occur, still, should this requisition be made too often, it might probably come about that the response assumed proportions beyond the capability of even the additional consumers to cope with; and in the first instance, if only to render the task of the absorbents less arduous, the tissue elements, prompted to undue participation, become, as a consequence of their indulgence, still greater stimuli, leading to freer lymph-flow, and so on. Greater demand is followed by hyper-proportional supply until we arrive at a condition where, progress as it will, the plasma contribution always exceeds the power either of the greedy overgrown tissues to overtake or the congested lymphatics to carry off. No doubt the filaria takes part in the extra voracity and its consequences; a morbid condition is set up in the worm: she miscarries, a state, by the way, in itself possibly capable of intensifying surrounding excitability; and then we have that step beyond mere excitation capable of inducing increased functional activity, as pointed out by Sir JAMES PAGET, and something allied, if not precisely similar, to the inflammatory condition is set up. At first this may go no farther than those febrile manifestations, lymphatic fever, exhibited so generally in elephantiased patients. The embryo filariæ from the affected worm or worms, discharged more and more prematurely, gradually fail in the vitality necessary to carry them beyond the glands, and at last cease to appear in the blood. In a word, I would suggest that after setting the morbid process going, the parasite, beyond possibly tending to continue the excitation, ceases to take any direct part in the action itself; nay, she may herself succumb to its vigour, forming the centre of a defined inflammatory area, and her remains finally find exit when the resulting abscess bursts or is incised.* Should the host be in

* MANSON, *op. cit.*, Case 23.

a position liable to continued parasitic invasion, of course with the advent of each worm the tendency to set up excitation is greater; and when at last the limits are reached, and the filarial irritation, whether by reason of numbers or morbid changes in one or more of the invaders, becomes greater than is compatible with a normal condition of nutrition, evil consequences are induced and go on until the disease under notice is fully developed. Limited only by the power in the exciting cause or causes to extend their effects, we might thus account for the varying position and extent of the manifestations so often observed; though if, on the other hand, we attribute their origin to something necessarily affecting a whole region, the frequent restriction of its effects to a portion only would scarcely admit of such simple explanation. I think the case of the gigman To Ah may usefully be quoted here in illustration of my supposition. This is the same man who formed the subject of my observations and experiments described in the Customs *Medical Reports* (xxi, 6), where his history was thus given:—

In October 1879 he was 28 years old. He is a native of Amoy, where he resided until he was 21. From the time he was about 14 or 16 he has suffered at various periods from "fever and ague." At about the age of 18 or 20 he first noticed swellings in his groin, which, however, have increased but little; in fact, he thinks they show a tendency to lessen in size. He suffers during the hot season from sharp attacks of "fever and ague;" otherwise he is in good health, well nourished, and generally fit for his work. He was not aware he had filariæ in his blood, and does not think much of the fact, although he watched the embryos under the microscope with much interest. He has visited Amoy twice since he first came to Formosa, but as his friends and relations have all died off, he thinks of permanently settling here. He does not suffer from any inconvenience whatever when pulling, even long distances, in the gig, nor does he find that he is unfit for considerable exertion of a pedestrian kind, and often accompanies his master shooting, carrying a tolerable weight all the time. Is quite willing to allow me to make the experiments explained to him, and will be glad if he can be cured of his tendency to "ague" altogether, as "then he would be quite well." There is nothing abnormal to be seen about his scrotum or legs, and in every way he appears an athletic, well-developed man.

At the time I wrote, enlargement of two right inguinal glands was observed, but he told me then, and I afterwards found it to be the case, that other glands occasionally swelled. This generally happened just before and during his attacks of lymphatic fever. Gradually, however, he has lost all tendency to these attacks, having had no fever of any sort for the last three years, and the glandular enlargements have quite disappeared. He has, I regret to say, become an opium-smoker, but to this indulgence he strenuously attributes the absence of lymph fever. Should this latter be a manifestation of inflammatory disturbance in the way I have suggested, it is possible the narcotic might, in the absence of increased or increasing excitants, keep down a tendency formerly encouraged by residence in a locality where fresh incentives were being constantly received. There can be no doubt that, though still vigorous, the average number of filariæ found in his blood at any given time is less than it was six years ago.

His general health keeps good, and he works hard now as a mason's assistant. He has no signs anywhere of tissue overgrowth, and I think has good reason to hope that he is getting over the liability to this lesion. Being removed from the district where the filariæ sanguinis hominis are abundant and constantly being propagated, to one where the cycle of genesis is abruptly interfered with, as seems to be the case in Formosa, he is freed from the risk of increased invasion, with its consequences. The existing worm or worms, which had located

themselves before he left the mainland, are situated in parts indifferent to their presence, although parasites not originally so placed did commence their irritative action, as his former febrile seizures show; and had he remained in a district where the number of parents could have been added to, some of these fresh arrivals would in like manner have themselves taken on a morbid state, and so directly assisted in intensifying the irritative action set up in the parts, or by further debilitating the original offender indirectly contribute to this result. No such additional incitement being available, the affected worm or worms, favoured by the comparative quietude, have recovered their health and ceased to be undue incentives to hyperplasmic exudation.

It may be that the mere presence of parasites in numbers is all that is required to start abnormal action, and unless plurality is possible, man can within these limits act as hospitable host without discomfort to himself or detriment to his guest. After a time we must suppose the filaria dies and is carried away. Should her decease ensue in the course of nature, and not be brought about by any violently stimulative process, we can assume that the remains, like much other apparently irritative matter, are quickly and unostentatiously removed by the absorbents. If these surmises be correct, they would tend to account for the fact that removal from place to place, and especially out of the area where filarially-induced elephantiasis is prevalent (so strongly insisted on by Sir J. FAYRER), is likely to be beneficial, while, as helping to control both tissue greed and its effects, that which tends to limit plasma supply must also be adopted in further treatment of the case. On the foregoing hypotheses, the first and most essential step in treatment is to secure immunity from further infection. Unfortunately, in those countries where these diseases abound the people are so situated that in the majority of instances were cure to depend on removal from one place to another, the advice would be apt to coincide with the proverbial "beef and wine" prescription for the starving pauper. Happily, as far as filariæ are concerned, we have other means for debarring their further access, namely, by filtering and boiling all water drunk by the patient. With reference to the cure or amelioration of mischief already set up, looking at the vast amount of testimony there is in favour of controlling blood supply, and, as far as I am at present concerned, its seeming concurrence with the theories now submitted, it would appear that temporary or permanent obstruction of some main source is the primary remedy suggesting itself.

Notwithstanding the weight of opinion favourable to deligation of arteries, and the apparently excellent results I have myself seen follow such treatment in the early part of my medical career, when placed in a position affording great opportunities for studying elephantiasis, I am bound to admit that, theoretically as well as practically, I believe all that is required can be gained by limited pressure applied occasionally to the main vessel and more permanently to the affected part. In this hospital, though elephantiasis as a severe and chronic condition arising from filaria sanguinis hominis is unknown, a condition pathologically the same, following, or concomitant with, ulcers or wounds, is sometimes seen, and I have always found MARTIN'S rubber bandages, together with other local and constitutional remedies, effective. With elephantiasis due to filaria sanguinis hominis in a district where the parasite flourishes, I can readily imagine such treatment could at best be of only temporary benefit if not combined with means for preventing further infection and modifying existent irritation;

but if so associated, then I think occasional pressure on, say, the femoral, either digital or by tourniquet, together with elastic bandaging and suitable internal remedies, are likely to bring about most satisfactory results. The non-combination of the prophylactic and curative in the East may account for the want of that success which seems so often to have followed arterial ligature in Europe. Even in the West it may be open to discussion whether less extreme measures for carrying out the same principles would not succeed equally well. One is inclined to hesitate before entirely throwing over the theory on which the procedure is based, because an apparently too severe form of practical application has hitherto been adopted, or because it has failed to show sufficiently satisfactory results in cases where circumstances outside the procedure itself have been antagonistic to a fair test of its efficiency. What is now suggested is neither new nor original, especially if one takes the recommendations singly; but should the etiology of elephantiasis be somewhat similar to what I have attempted to sketch, then firmer hopes of success, based on strict conjunction of the protective and remedial methods, may be conceived in places where the results have hitherto differed from those reported by some European observers. While arriving, though by different reasoning, at the same indications for treatment as those Dr. MANSON more than hints at, I do not quite share his despondency as to permanent benefit in cases of advanced elephantiasis of the extremities. With advanced elephantiasis scroti, even supposing we could readily apply means for regulating blood supply, little or nothing is to be gained by rejecting the usual treatment. FAYRER and MANSON have taught us with what ease and safety amputation may be accomplished, and on grounds of convenience and comfort the operation undoubtedly offers the highest attraction. To prevent recurrence, prophylactic measures would certainly be required, and if the flaps showed a tendency to take on diseased action, then it is possible that resort to pressure, etc., might overcome liability to relapse, and complete the cure.

I may mention in conclusion that Dr. ROUTH'S statement and experience has so struck me that I have determined on trying a further set of experiments with monkeys, to see whether by injecting nitrite of amyl I could induce artificially a similar result to that Dr. ROUTH mentioned having seen follow its accidental insertion under the skin. I am the more tempted to do this as there appears something very analogous in the action of the drug on the vascular system to that brought about by the filaria sanguinis hominis or other excitants when playing a similar part. The effects of both are alike—vascular congestion and consequent plasma exudation. The relationship is as striking as it is interesting; and if the asserted result of amyl injection accord with further investigation, it seems to me that the evidence in favour of the theory I have suggested as to the etiology of elephantiasis and its allies will have been even more effectively strengthened than by Dr. ROUTH'S single observation, curious and important as this is.

DR. W. W. MYERS'S REPORT ON THE HEALTH OF TAKOW AND TAIWAN-FU (ANPING)

For the Two and a Half Years ended 30th September 1886.

DURING the period under review, notwithstanding that it includes the six months we were blockaded by the French, the general health of the community has been very satisfactory. Among residents there have been three deaths, one adult and two infants, as follows:—

1.—1884.	Male resident	. . . . .	.	Enthetic disease.
2.— „	„	„ (infant)	. . .	Marasmus.
3.—1885.	„	„ („)	. . .	Morbus ceruleus.*

Of non-residents, one male was brought here dead, and was buried in the cemetery. From what I knew of the man's case, together with the statements as to the symptoms preceding death, I believe this to have been consequent on hepatic abscess bursting into the peritoneum.

No. 1 exhibited but few general symptoms until about 10 days before death, when signs of cerebral lesion were developed. One remarkable peculiarity about the case, however, was that while feeling generally well, and functions apparently normal, the patient complained of subjective sensations of heat, quite out of keeping with the actual atmospheric conditions. To relieve this he soaked in cold water during the greater part of the afternoon, and slept naked on his verandah all night. He positively refused to admit that he was ill, and went about his duties as usual, including some severe mental labour. At last violent vomiting and purging set in, with progressive loss of consciousness, ending in coma and death. At the post-mortem, gummatous deposits were found in the head, and other lesions connected with these, which accounted for the result.

No. 3 was an infant about 14 days old, born apparently strong and well, and up to a few hours before its death thought to be in excellent health. It fell asleep about 9 P.M., but sleep gradually deepened into coma, and death took place at 5 A.M.

Cholera.—Towards the close of the short epidemic which broke out at the termination of the French affair, I was called to see a man apparently in extremis, and entreated to do something. He was vomiting constantly, and the bowels discharging the characteristic alkaline fluid. Being baffled in my attempts at getting him to retain anything, and looking on the case as desperate, I ventured to inject into the small intestine, as near its origin as I could guess, the following mixture:—

Acid. sulph. dil.	℥xx.
Tr. croci	℥xv.
Aquæ	ad ʒi.

I used the finest needle of the aspirator, fixed to a syringe prepared for the occasion, and gave in all three injections. After this the dejections showed a decidedly acid reaction. The usual remedies, such as friction, heat, subcutaneous injection of ether, etc., were simultaneously applied, and indeed had been used prior to my giving the abdominal injection.

Whether as coincidence or consequence I cannot say, even if one could venture any surmise on the result of a single case, but at or about this time a sudden change for the better set in, and from then onwards recovery was rapid.

* Certified by medical attendant.

It might be thought that the likelihood of injecting the peritoneal cavity was greater than that of getting into the gut, but the distended condition of the latter encouraged me to make the attempt, which, so far as the operation went, was, I am sure, successfully accomplished.

I was not able to get hold of another case, as the epidemic, never very extended, ceased immediately afterwards. I can, therefore, only narrate my experience for what it may be thought worth. I may mention that I added the saffron on account of its asserted effect on the comma-bacillus.

Malaria.—Under this heading I would desire to call attention to one or two varieties, which are certainly worthy of notice.

1.—A very common form, met with both here and in the Taiwan-fu hospital, presents at first sight the appearance of tabes dorsalis. The patient says that he comes from a district where malarious fevers are common; he has himself suffered for long from fever and ague. After a time (and if from the northern districts, it is generally noticed from the commencement) the fever has been the most marked manifestation, the cold stage gradually lessening in duration until it has almost ceased to be noticeable. Soon unsteadiness of gait is perceptible, and this may go on until complete loss of power in the lower extremities is arrived at. If told to shut his eyes he staggers; knee-jerk is absent, though he retains considerable power in his flexor muscles. He denies the occurrence of "lightning pains," while the duration of the affection from onset to its extreme height is comprehended within a few weeks or, at most, months. Put on large doses of quinine, with tonics and cod-liver oil, recovery is generally rapid. It may be thought by those holding views as to the malarious origin of beri-beri that this is but a variety of that disease; but although I have carefully watched several cases, I have been unable to discover anything which would warrant me in supporting such a conjecture. If we accept AFANASSIEW'S views as to the migration of distended lymph corpuscles forming emboli in the vessels of the brain, and thus leading to lesions there, it is quite possible that similar effects may be produced in the substance of the spinal cord, which, as in the cerebral cases quoted by that writer, give way to quinine.

2.—Another very general and not unimportant variety of malarial affection is a more or less chronic albuminuria, which, when accompanied by œdema or ascites, as is not infrequently the case, may lead to misapprehension. The urine is albuminous, from the merest trace up to complete coagulability; casts are present; but with all this one does not find many of those symptoms generally associated with Bright's disease. Two prominent peculiarities are noticeable, and these are the extreme sensitiveness of the precipitate to slightest excess of nitric acid, and the high specific gravity of the urine, ranging generally from 1018 to 1020. I have repeatedly seen persons in the East whose urine has deposited albumen, and whose cases I have been led to look on as worthy of anxiety; but I have as often been surprised at the continued absence of those manifestations of progressive disease which surely come on in true parenchymatous nephritis. This condition, until late years, I have often been at a loss to account for satisfactorily. Dr. GEO. HARLEY of London, in his work on diseases of the liver, calls attention to such a condition of urine as I have described, which he names "hepatic albuminuria," laying particular stress on the specific gravity as a valuable diagnostic sign, differentiating it from genuine Bright's disease, where the "density is never higher than 1012

or 1015." In this hospital I have on many occasions carefully looked for liver disorganisation in these cases, but cannot say that it has existed to such extent as would warrant my attributing the effects to that cause; whereas full doses of quinine, followed by iron and strychnine tonics, have often brought about a most satisfactory condition both of the general health and the urine.

A patient came in from the island of Lambay, exhibiting at first sight the appearance of Bright's disease. He was dropsical; of waxy hue; urine highly albuminous—specific gravity, 1020; and he was generally very ill. He said he had suffered some years ago from fever and ague, and at that time was seldom free from what I can best translate as a state of low fever. His present ailment had, he thought, been coming on for about 18 months or two years. The respiratory and circulatory systems were normal. He perspired freely, and gave no history of any of those symptoms I expected him to enumerate. Under treatment, in which quinine figured largely, he improved rapidly, and though he insisted on leaving while there were still minute traces of albumen, his general state was so satisfactory, and he felt so well, that I could not persuade him to give me fuller opportunity for observation. I have on one or two occasions heard of him, however, and the accounts have always been good. Though this was perhaps the most desperate-looking case on admission, still it serves as a good type of many others.

The absence of cardiac and other characteristic symptoms is a useful diagnostic point in this formidable-looking ailment, the chronicity of which and immediate disconnexion from other malarial manifestations distinguish it from that which is often met with as a passing sequela of sthenic disease.

Of late we have heard from all sides of the frequent co-existence of albuminous urine with organically sound kidneys. This has no doubt conveyed its due meed of comfort to many alarmed albuminuriacs; and it seems to me that, in this part of the world, where residence in more or less malarious districts is the rule, the fact that the much more realistic simulation of a deservedly dread disease is only one of the protean forms of an affection less grave as to its possibilities and perhaps more amenable to treatment, opens a wide portal for hope to anxious patients.

3. The last but not least important phase of malarial manifestation that I desire to call attention to is that known in India as typho-malarial, and elsewhere as the mixed fever of tropical or sub-tropical climates. One peculiarity that we have most to do with here is its restriction to a certain area, comprising the alluvial plain to the north of Takow, and extending from the base of the nearest hills to the coast. Within these limits are included the city and settlement at Anping.

Intermittent fever undoubtedly occurs at Takow, but, as far as my experience goes, is of the ordinary "fever-and-ague" type, sharp while it lasts but soon got over, and fortunately nowadays not often contracted.

With cases from Taiwan-fu, the fever is also intermittent, in fact markedly so, but the adynamic symptoms accompanying it, together with its tenacious and insidious character, stamp the affection as one materially differing from the type met with at the southern port. As to whether both kinds of disease owe their origin to germs originally the same in nature and species, but which eventually differ by reason of further development in favouring media accessible to one but not to the other, or whether the true malarial germ unites with another in producing a hybrid affection, I am unable, in the absence of all opportunity for

pathological research, to offer an opinion; but this I do know, that the fever of which I speak, and which for convenience of description I will call typho-malarial, is remarkably different from anything I have seen before, although at some points it has reminded me of what I once saw a good deal of in Central America, namely, "Colon" or "Chagres" fever. When compared with the ordinary enteric fever of Europe, the resemblance is not only striking but in many instances exact. Indeed, but for the temperature curve one would have no difficulty in at once characterising it as true typhoid, less malignant, perhaps, but still distinctly of the same nature. Insidious in its onslaught, when it fairly seizes a patient, a condition is developed which gives cause for the greatest anxiety. As before remarked, I have only met with cases among the residents at Anping or Taiwan-fu, and if they are wise enough to come beyond the area of infection—*e.g.*, to Takow—the course of the malady is arrested or materially modified. Even after the disease has set in with full vigour, I do not hesitate to recommend immediate removal to the southern port, and I have invariably found marked improvement follow the change; while with those who do not follow this advice, the affection has run to lengths which have given rise to grave anticipations. The head is a favourite seat of attack, the manifestations there varying from severe periodic neuralgia to raving delirium, according to the acuteness of the seizure.

As a sequela to several cases of the worst form, intelligence has been more or less clouded or affected for some considerable time subsequent to the removal of the patient, and even after apparent convalescence has set in. There is always a great liability to bowel affection, which very often assumes the hæmorrhagic or dysenteric type. If once a patient has fairly got under the influence of the poison, it is apt to hang about him for years, breaking out, even at home, at odd times, not infrequently in winter. The temperature does not often go higher than 102° or 103°, although I have seen it as high as 105°, but in the morning it generally returns to normal or thereabout. In the transitory fever and ague attacks met with at Takow I have frequently seen the temperature rise to 105° or 106° during the hot stage. Vomiting is not so common in the Anping variety as in the acute Takow form, though sometimes, if the disease has advanced far, and especially if the patient remains where attacked, I have known it come on in a way that materially added to the general anxiety. It is obviously due to cerebral causes, other symptoms of which either precede or immediately follow the manifestation. The delirium is generally of the muttering, semi-conscious type; the patient can be roused to answer rationally, but soon falls off again. I have not met with coma-vigil properly so called. The typhoid eruption is generally seen on the abdomen and arms, coming and going in the usual crops. The stools are of the "peasoup" kind and not infrequently, especially towards the climax, are accompanied by hæmorrhage with mucus. Notwithstanding all this formidable appearance, I have not as yet met with a death among those attacked on shore, though it must be admitted that the list of those who have suffered serious and permanent injury from persistent residence there is now getting large. I am convinced that persons resident in these districts should come south at regular intervals, if only as a prophylactic measure; and if they would reduce the severity of attack to a minimum, they should on any signs of infection leave at once for Takow, where a short stay generally enables them to shake off present bad effects and regain a fairly satisfactory state of health. Those of the northern residents who, for

business or other purposes, make periodic visits to the mainland, keep in good health; but should persistent residence ever become a necessity at Anping or Taiwan-fu, we shall have to reckon upon a much heavier sick return from that port, while the working strength of establishments so placed will have to be calculated with reference to contingencies never previously anticipated in South Formosa. For ladies and children, especially the latter, I imagine the risk of injury would be very great, and indeed I would strongly recommend that, where possible, as in the case of officials bound to reside all the time at Anping, if married they should hesitate before bringing their wives and families to the port, unless their position or duty enabled the latter to live at Takow. As I have mentioned in previous Reports, crews of ships lying in the Anping Roads, never having communicated with the shore, *i.e.*, not having taken in water or been granted leave, exhibit this peculiar type of disease, and in fact all the cases of pernicious fever coming under my notice afloat, occur up there.

It seems difficult to account for this marked malignancy of type in those attacked at Anping (Taiwan-fu). Delightful breezes prevail at all times of the year, which one would think ought to act as diluents and dispersers of the poison; but this is not so, as we have good reason for knowing. The soil at and around the city is of a loose, open nature, and but a few feet below there is a stratum of clay, which no doubt hinders the rapid percolation of surface water,—in fact, favours its collection. Anping is at present all "made ground," consisting of a very tenacious blue clay. I fancy the latter place suffers, like the shipping, more from its proximity to the districts behind than from any inherent qualities. Practically, however, this does and can make but little difference to those who will suffer from continued residence there. The following extract from TOMMASI CRUDELI'S paper* bears directly on the subject of telluric influences and how originated:—

> The production of malaria occurs in districts situated at considerable heights, and it is not necessarily connected with the presence of either marshes, ponds or rivers, nor with the admixture of fresh with sea water, nor with the maceration of hemp and lint, nor with other putrefactive processes in organic substances. It is calculated, approximately, that two-thirds of the malarial districts in Italy occur on heights, and even on mountains. Sometimes the surface of these districts is completely dry during summer, but the production of malaria in them goes on just the same, provided they are kept moist below the surface by special conditions of the sub-soil, and the air can reach the moist strata by pores or crevices in the surface.

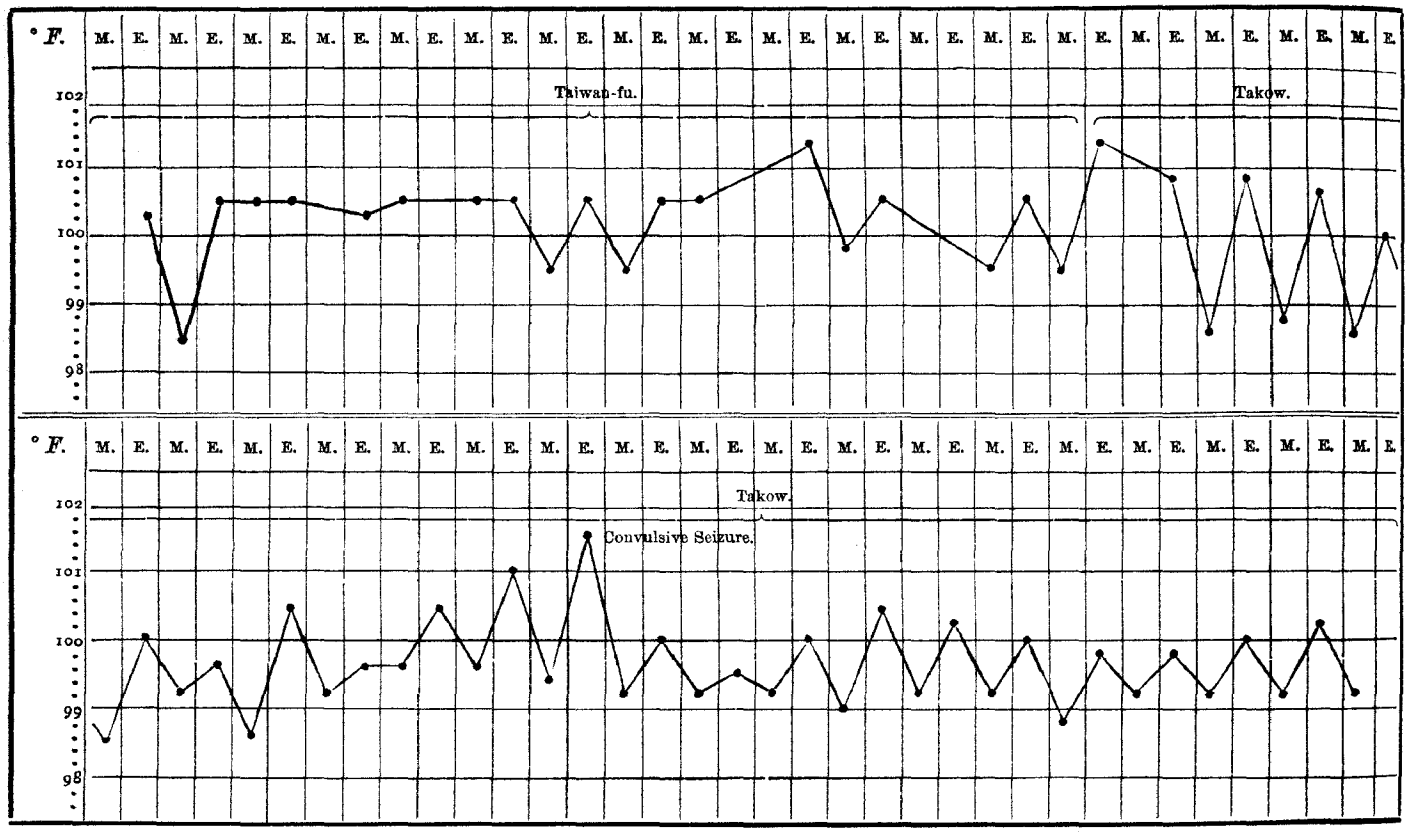
This is the condition of the greater part of the rising ground in the Campagna of Rome.

The action of quinine at first may not be very marked in this variety; still, one feels it is the sheet anchor to be depended on nearly all through, though no doubt pressing symptoms as they arise have to be treated by other remedies; and during convalescence there is decided call for blood and general tonics by a system which is sure to show all the signs of extreme debility.

On the next page is a temperature chart taken from a case of typho-malaria occurring in the city. I may mention that, the weather having prevented removal to Takow as soon as was desired, the case showed some most unpleasant phases before change of locality was effected. As soon as this was accomplished, however, matters took a speedy turn for the better, and although there were one or two complications, one especially alarming, of a convulsive nature, convalescence went on steadily.

* *Practitioner*, 1881.

TEMPERATURE CHART from Case of TYPHO-MALARIAL occurring in TAIWAN-FU, and removed to TAKOW.



"DAVID MANSON" HOSPITAL.

Since last report a severe call has been made on the resources of this hospital, which I am glad to say it was equal to; I mean the necessity for attending to the numbers of troops stationed in and around Takow during the time of the French troubles.

Upwards of 4,000 patients passed through the hospital during the year 1884–85, of whom nearly 3,000 were soldiers. The prevailing ailments were those due to over-crowding and exposure, but no epidemic broke out.

As we were not actively attacked by the French, there was little or no military surgery required, and indeed under this head the only case calling for special notice was one of an unfortunate cargo-boatman, wounded by a fragment of a shell. There was much comminution of bone, and injury to the nerves. In spite of all that could be done, he died of tetanus a week after receiving the wound.

Besides the large amount of aid given to the soldiers attending the hospital, a good deal of camp visiting was accomplished, and advice was given as to the laying out of latrines, and other sanitary precautions for the good of the encampment. Some commandants were willing to do as was suggested, but others were indifferent; still, on the whole, if it did nothing else, the wish to serve, and the work actually done in hospital may have taken part in preserving that excellent *entente* which existed between the foreigners and the people, official, civil and military, during the time of our blockade.

In view of an expected bombardment, splints, bandages and other appliances were ready, and stations out of fire selected for first assistance to the wounded, as well as preparations made for establishing a more permanent hospital in the rear.

In all this the dispenser and other Chinese professed themselves most willing to take part, and I believe that they would not have been found wanting. Happily, however, we scarcely heard a hostile gun fired; and but for our isolation from the outer world we might have been anywhere but on the scene of military operations. My colleague at Taiwan-fu had his hands equally full, and somewhat more actual military work, as those of the wounded, whose state permitted them to escape from the Pescadores, landed at Taiwan. As may be supposed, the difficulties of transit were not favourable to the escape of desperately wounded persons, and so I understand no case of very particular interest or difficulty presented itself. Still, the hospital all the time was doing good work, and had a most beneficial effect in engendering and keeping up the good feeling which existed.

Dr. ANDERSON also made all necessary arrangements for assisting the wounded in the event of an action taking place, and he too was, I am told, equally well supported by his native assistants, who agreed to stand by him. At the termination of the blockade His Excellency the Taot'ai, besides giving an extra donation of $100 to each hospital, sent a lot of medicines and surgical appliances, which seemed to have been hoarded in his yamên, for distribution between the two institutions.

Last year we have had 3,460 patients, and although most of the troops are removed, still there are a sufficient number in the neighbourhood to add considerably to the calls on the hospital, now its ordinary patients from the surrounding districts have once more commenced to come in. Of course, during all the time of the French scare we saw little or nothing of these, which, considering the large influx of soldiery, was perhaps rather fortunate.

Medical School.—I can now announce with great pleasure the accomplishment of the first stage of the educational project set forth in my last paper. At the end of May 1886 the two students, LI TSUN-FAN and CHANG CHING-KAI, presented themselves before a medical board in Hongkong for examination in anatomy, physiology, inorganic chemistry and elementary surgery. After an examination extending over three days, they were declared to have passed "very creditably," LI obtaining 74.6 per cent. (he got 90 per cent. in anatomy), and CHANG 70.5 per cent. of the maximum obtainable marks. (The latter scored 85 per cent. in chemistry.)

The board was constituted as follows :—

Deputy Surgeon-General HUNGERFORD, P.M.O.	*President.*
Staff-Surgeon PRESTON, R.N. PATRICK MANSON, M.D., LL.D.	Anatomy.
Colonial Surgeon P. B. C. AYRES C. GERLACH, M.D. (German)	Surgery.
WM. YOUNG, M.D., C.M., etc. HO KAI, M.B., C.M., M.R.C.S. (Chinese)	Chemistry and Physiology.

A copy of the papers set on each subject is appended. His Excellency the Acting Governor kindly placed the Legislative Council Chambers at the disposal of the examiners for the oral, which was conducted in the same way as at home, and with the aid of the model, bones, plates, etc., was as practical as possible. The candidates were separately examined for 20 minutes on each subject.

His Excellency the Acting Governor further presented the certificates to the candidates in the main hall of the Government Central School, in the presence of several of the leading government officials and members of the community, foreign and native. The press and the citizens took the matter up warmly, the latter, afterwards, coming forward most handsomely in helping to support the lads during their further course of study for the final diploma. It is now proposed that the next examination be held, about 17 months hence, at Shanghai, when the students will have completed their full curriculum, extending in all over four years. I hope to secure similar assistance from the profession at that port when in due course I appeal for kindly aid in conducting the examinations.

DAVID MANSON MEMORIAL HOSPITAL and MEDICAL SCHOOL.

First Professional Examination.

ANATOMY.

May 13th. 10 A.M. to 2 P.M.

1. Enumerate the foramina of the temporal bone and the structures they transmit.
2. Describe the knee-joint, its cartilages, ligaments and synovial membranes.
3. Enumerate the muscles moving the shoulder-joint, their origins, insertions and nerve supply.
4. Enumerate the extrinsic muscles of the eye, their origins, insertions and nerve supply.
5. Enumerate the structures in the anterior triangle of the neck, and their relations.
6. Describe the pudic (sometimes called internal pudic) artery, its origin, course, termination and relations.
7. What nerves supply the tongue, heart, diaphragm and hand?
8. Describe the kidney, its size, shape, structure and vascular supply.
9. Describe the popliteal space, its boundaries, included structures and their relations.
10. Give the structures forming the root of the lungs on both sides, and their relations.

N.B.—Six questions only to be attempted. Four hours allowed.

CHEMISTRY.

May 13th. 3 P.M. to 6 P.M.

1. Give the chemical formulæ of the iodide, bromide, chloride, chlorate, nitrite, nitrate, cyanide, acetate and hydrate of—ammonium, potassium, sodium and silver.
2. Describe an acid and an alkali.
3. Describe the physical and chemical properties of water.
4. What weight of oxygen can be got from 20 pounds of potassic chlorate?
5. How is chlorine prepared? State its action on—
   (*a.*) Colouring matter;
   (*b.*) Metals;
   (*c.*) The flame of a candle.
6. If a solution of argentic nitrate be added to a solution of sodic chloride, what is the nature and colour of the deposit? Give the equation.
7. Name the principal compounds of iron and those of mercury.

N.B.—All the questions may be attempted. Three hours allowed.

SURGERY.

May 14th. 10 A.M. to 2 P.M.

1. Describe the various tumours occurring in bone, and their structure.
2. Describe the different kinds of aneurism, and objects of treatment.
3. Describe hydrocele, scrotal hernia, hæmatocele and varicocele.
4. What consequences may attend fracture of the ribs, and how are they produced?
5. What is erysipelas, and describe the different kinds?
6. What is caries, and what is necrosis?
7. Name and describe the different forms of inflammation of the joints.
8. What is gangrene, and name the different forms and causes?
9. Name the dislocations of the shoulder-joint, diagnosis and how reduced.
10. What are the different kinds of cancer, and name the parts of the body where they occur?
11. Describe the process of healing in bone.
12. Give the principal fractures involving the elbow-joint, and state how diagnosed from dislocation.

N.B.—No more than 10 questions to be attempted. Time allowed, four hours.

PHYSIOLOGY.

3 P.M. to 6 P.M.

1. Describe the skin and its appendages, with their various functions.
2. Give the names of the muscles that are concerned in—
   (*a.*) Ordinary respiration;
   (*b.*) Extraordinary respiration;
   and state the changes in the blood after each act.
3. What is peculiar in the portal circulation and that of the kidney?
4. What do you understand by the terms "secretion" and "excretion"? Name the chief secretive and excretive organs.
5. What are the functions of the liver? and give the composition of bile and its use.
6. Give the functions of the kidney and the composition of urine.
7. What is the deep origin, course and distribution of the optic nerve, and how do you account for the phenomenon of single vision with two eyes?

N.B.—All questions to be attempted. Time allowed, three hours.

The following are the regulations under which it is proposed to admit candidates to examination for the certificate granted by this hospital:—

1. No student can commence his medical studies unless he is familiar with English, reading and understanding it thoroughly; and has otherwise received a fair education in arithmetic and other branches of elementary education as understood in Western countries.

2. Before being admitted to the first professional examination every student must have studied the following four subjects, namely, anatomy, inorganic chemistry, physiology and elementary surgery during two full years, in some hospital recognised by the board of examiners, under a legally qualified practitioner, who must certify that he has taught all these subjects practically and systematically during the aforesaid period.

3. On passing the primary professional examination the student will be required to undergo a further course of study for two years in some hospital recognised by the board of examiners, under a legally qualified practitioner, who must certify that the student has been systematically and practically instructed in practice of medicine, pharmacy and therapeutics, clinical medicine, clinical surgery and midwifery for two full years after passing his first professional examination.

4. On production of this certificate and also one of his identity with the candidate who passed the first professional examination . . . . he will be admitted to the final examination.

5. On passing his final examination the candidate will be presented with a diploma, signed by all the members of both boards of examiners.

6. No candidate rejected at one examination can again present himself until he has studied one full year, at some hospital recognised by the board of examiners, all the subjects required for the examination at which he has failed.

7. Any candidate found copying, or who may be adjudged by the board of examiners to have otherwise misbehaved, will be at once rejected and debarred from again presenting himself for examination for such time as the board of examiners may direct; and from their decision there can be no appeal.

8. The examinations will be held in China and Hongkong, and every candidate must pass one examination at a port in China, and the other at Hongkong.

9. * * * * *

10. No teacher or other person interested as such in any candidate's acquirements may sit on an examining board before which such candidate presents himself, or have any voice in such candidate's examination or its results.

11. The board of examiners for each division must consist of at least six legally qualified practitioners— . . . . . including the president—representing two or more nationalities.

12. The members of the board of examiners for the first division having certified that a candidate has passed the examination for which they are responsible, the diploma shall be returned to the hospital or other approved guardianship, and in no case be removed from this custody until such time as the candidate named therein has passed his final, and the latter fact has been attested by the signatures of the final board.

The examinations will be conducted both in writing and orally, the candidate being examined, as far as possible, from specimens, plates, preparations or models, for at least 20 minutes on each subject.

The foregoing are the regulations under which the examinations in Hongkong were conducted and by which the present students are governed. Of course they are only put forward tentatively, and though, thus far, have been thought sufficient, are open to such additions or modifications as may hereafter prove necessary. The great object which I assume all interested in the subject will demand is that the professional acquirements of the candidates shall be thorough, and that the attestation of this comes from persons whose standing and impartiality render their testimony unassailable.

It is to be hoped that in this way men, educated entirely in China, may be obtained whose professional acquirements will be above suspicion, while their qualifications may be accepted as equal to those required of the average practitioner in Western countries.

It may seem that these arrangements are too elaborate for the number of students at present under instruction; but to this I would reply that everything must have a beginning, and that at best this is but a private effort, which, insignificant as it may appear, yet considerably taxes the ability of those who have assisted in originating it. It must be remembered that these lads have already drawn on their parents for support during seven or eight years while studying English, and that the extra four years now required

are quite outside of any calculations which had been made by those who anticipated that at the end of the Hongkong school course their sons would at least have been able to support themselves. As it is now, to get our qualification, they, or any other aspirants, must have been engaged in study for 12 years at least. Thus, were it not for the support which the hospital gave during the first two years and that which the generosity of the Hongkong community now affords for the remainder of their curriculum, much as these lads desire it they simply could not have gone on. No doubt in time, if the career holds out sufficient inducement, students will come forward who are able and willing to relieve the school of the burden cast on it. But this will take time and a higher prestige than we are at present able to confer.

I am glad to be able to report that a well-to-do Chinese gentleman in Hongkong was so taken with the idea that he has sent his son, a most promising student, to study, paying all expenses for board, clothing, etc. To show what can be done two students are as good as 200, although the latter number would certainly be more encouraging as to the permanency of the undertaking. If fortunate enough in convincing others of this, I have no fears as to such a supply of material as will satisfy the most captious critic.

Should this scheme assume larger proportions, it may be thought that Formosa is a somewhat out-of-the-way place for such an establishment; and although I must admit that location in a less isolated spot would be more agreeable, still I am bound to mention that my experience tends to strongly support its selection, by reason of that very isolation with its consequent absence of outside attractions so apt to tempt young students from their work. If they do not study, life here would be very monotonous; but even supposing their characteristic assiduity reduced this risk to a minimum, I still think from what I have seen that the advantages indicated point to the advisability of either adhering to this place, or, if another is desired, choosing one presenting similar local inducements to uninterrupted application.

The certificate and diploma referred to in the above account are parchment documents, bearing the seal of the hospital. They attest respectively:—

1st (Form No. 1). Fulfilment of the required periods of study in the DAVID MANSON Memorial Hospital. This is signed by the honorary surgeon and instructor, and is in English.

2nd (Form No. 2). Passing of the first professional examination. This is signed by the presiding examiner and countersigned by the honorary surgeon and instructor. It is in English and Chinese, and sets forth that holding it in no way authorises the bearer to practice medicine.

3rd (Form No. 3). Passing of the final professional examination. This is the diploma, and is signed by the members of both boards of examiners, and countersigned by the honorary surgeon and instructor. To it a photograph of the successful candidate, stamped with the hospital seal, is attached. It is in English, Latin and Chinese. It is endorsed in English and Chinese with a notice setting forth the conditions of authenticity of diplomas purporting to issue from the hospital, and giving a list of the persons who up to date have succeeded in obtaining the licence. All this is further authenticated by the candidate's signature, his thumb mark, and the signatures of the members of the hospital committee.

We have not had our usual visits from the aborigines for two or three years. No doubt the French troubles first interfered, and afterwards the strained relations which exist with the Chinese, and consequent war-like outbursts, account for this. Apropos of these people it may be well to mention an incident that occurred two months ago, and which is interesting as throwing light on the way the "savages" got into Formosa originally:—

Five or six natives of the Philippines, including a woman and her child, were crossing from one small island to the other in a very frail looking dugout, when they were blown out to sea, and according to their account were 26 days making the passage to Formosa, during 13 of which they were without food or water. They landed at a port to the north of Taiwan-fu, and although every kindness was shown

them by the officials and people, one, an old man, succumbed soon after getting ashore. The rest were sent on to Taiwan-fu, where they were kindly, almost tenderly, treated by His Excellency the Taot'ai, given as much food as they required, clothed and handed a present of money on leaving by a steamer for their homes. Strange to say, notwithstanding the undoubted privations from want of food and exposure all must have suffered, the child, an infant at the breast, soon got over its troubles, and when it went away was in an apparently thriving state.

The conduct of the Chinese all through reflects the greatest credit on their humanity, and may be favourably remembered along with the manner in which they behaved to prisoners taken in the late troubles, who were kindly treated as guests, the greatest consideration being shown for their comfort and wants. This speaks volumes for the new departure which was then instituted, and is apparently being kept up by this great and progressing nation.

DR. A. RENNIE'S REPORT ON THE HEALTH OF TAMSUI AND KELUNG

For the Half-year ended 30th September 1886.

During the period under review the foreign community has suffered from the prevalence of malarial fever. Compared with the corresponding period of the preceding few years, the number of patients sick from this cause has been considerably above the average.

With regard to temperature, rainfall and other atmospheric conditions, the season compares favourably with previous years. During June the temperature was rather low and the rainfall considerable. In the beginning of July one or two cases of malarial fever came under treatment, and the number steadily increased until the first week of August, when one-half of the residents of the port were sick at one time. The temperature was high, and warm north-easterly winds prevailing; but, fortunately, when matters had got to the worst, the conditions were suddenly altered by the occurrence of a slight typhoon, the wind shifted to the south-west, the temperature fell, and in most cases convalescence was at once established. After a few days the temperature again rose, but the health of the community remained good until the beginning of September, when a transition took place to cooler weather. This change was rather sudden. Though a fairly equable temperature prevailed during the day, the thermometer dropped considerably at night and especially in the early morning, and no doubt chills so received formed the predisposing cause; at least, patients now attacked complained for a day or two previously of catarrhal symptoms, such as cold in the head, sneezing, lachrymation, and, when the fever was established, of rheumatic pains. Towards the end of the month the weather became cool and bracing and no fresh cases were reported amongst foreigners.

The same individuals had several attacks during the summer, but with the exception of two cases of remittent fever, all the other cases were of comparatively short duration and of an intermittent type, usually tertian. Even in intermittent cases it was exceptional for the cold or ague stage to be present; in fact, out of 21 cases I found it present in only two. The patient complained at most of a chilly feeling in the back, immediately succeeded by violent heat and headache, with vomiting of food and afterwards of bile. One of the remittent cases occurred at Kelung. I happened to be present when the attack commenced, and found that, without any preliminary symptoms, the temperature rose in four hours from normal to 104°.5. During the 11 days the fever lasted there were regular morning remissions of 2°. Finding at the end of 10 days that the patient was extremely weak and improvement doubtful, we got him removed to Tamsui, where convalescence at once set in. Ten days afterwards he had a relapse in Amoy, accompanied by obstinate diarrhœa.

The natives suffered severely from the fever, especially in August and September, not only in this neighbourhood but, I am informed, throughout the northern part of the island. The number attacked was unusually high, while fatal cases have proved of very short duration.

One can scarcely account for the high rate of mortality among them from this cause. Whether it is that their dwellings are as a rule more damp and insanitary, or the lines of treatment too lowering according to Western notions, or that the vital resistance to disease in general is less strong than in European races, it is difficult to say. I am inclined to think that, making due allowance for these factors, the race as a whole is more susceptible to and less able to resist the influence of the malarial poison.

From the fact that the Chinaman bears pain so well, readily undergoing without wincing such acutely painful operations as iridectomy, extraction of cataract, etc., one would on first thoughts naturally conclude that he would form a good subject for withstanding an attack of any sickness. But insensibility to pain may really imply deficiency of nerve energy. Pain may be well borne from two widely different causes. There is the pain borne with stoical indifference because the subject is pretty much insensible to it, and there is the pain acutely felt but endured with moral courage from a recognition of its expediency and with a strong effort of the will. The nervous system in the former case responds less keenly to stimuli, a condition more likely to obtain in the man who subsists on a diet largely carbonaceous but well adapted to the severe manual labour by which he earns a livelihood, than in the man who can afford to feed on substances more rich in those elements that go to the nutrition of the nervous and vascular systems. Thus, in the course of a severe attack of fever, the energy of the native gets sooner exhausted, often failing at the critical period even with the assistance of stimulants, while then it is that the superior staying power of the European manifests itself. At all events, taking two cases of equal severity, it is surprising how soon symptoms of prostration appear in the former as compared with the latter. It is by no means uncommon for a healthy native to succumb to an attack of fever in the comparatively short space of three or four days, death being preceded by low delirium, muscular tremblings and other adynamic symptoms. The period of remission is that of greatest danger, when the profuse sweats, coldness of the extremities and anxiety indicate a sinking of the vital powers from which the patient may not rally. Even in those recovering from an attack of this disease, convalescence is extremely tardy; for days the dry, brown tongue will persist with refusal of food and stimulants. Doubtless the powerful influence of the mind over the body is an element that largely tends to the fatal issue of some of these cases. The patient, as is not infrequent with Asiatic races swayed by superstitious notions, will often take a gloomy view of his condition, and from the outset decide for the worst instead of aiding recovery by hopefully looking for a favourable issue.

The treatment adopted by the native doctors is, as a rule, lowering, consisting in the administration of sudorifics, pricking the pit of the stomach, and, when collapse is threatened, violently pinching the skin to excite reaction. Stimulants even at this stage they hold to be contra-indicated. Many of the laity are now recognising the value of quinine.

It is worthy of note that within the past two or three years the prevalence of the disease in this locality has increased. From the fact that the cultivation of fresh land is receding further inland, and the physical conditions in general remain unaltered, one would naturally look for improvement in this respect.

From the admission book of the MACKAY Hospital here I gather the following statistics. I take the number of fresh admissions of malarial fever cases for the three months of July,

August and September in each year, and give the per-centage relatively to the number of fresh admissions of all diseases for the corresponding period of the year:—

Year.	Total number of admissions for July, August and September.	Total of admissions for fever during July, August and September.	Per-centage.
1882	486	36	7.4
1883	617	40	6.4
1884	629	81	12.8
1885	648	275	42.4
1886	1,273	485	38.1

Making due allowance for the fact that in the last year or two the number of soldiers treated for fever has been slightly out of proportion to the number treated for other diseases, and even allowing a slight margin for the possibility that the treatment of malarial fever by the foreigner is more quickly finding favour in the eyes of the native than that of other ailments, there still remains among the stationary population a large increase of the disease to be accounted for. It will be seen that the increase has taken place from 1883 onwards. In October 1884 the bombardment and attempted capture of the port by the French occurred. Prior to this event, with a view to repel the invasion, the Chinese threw up long lines of earthworks, running in a semicircular direction between the sea-shore and the foreign settlement, and distant from the latter about 450 yards. Up to the present time these have gradually extended so that they now cover a large area of what was formerly unoccupied ground. That the freshly upturned soil forms a highly fertile source for the dissemination of the poison, especially to residents in the more immediate neighbourhood, is highly probable.

In the malarial districts of the East and West Indies it is a well recognised fact that the miasm is carried for long distances by a wind blowing over a malaria-producing soil, while some authorities state that when favoured by ravines and hot currents of air it may even ascend a mountain side to a height of 2,000 or 3,000 feet. Separated by a hollow from the foreign settlement, the earthworks occupy in most of their extent a situation more elevated. The unhealthy nature of the situation has been forcibly illustrated by the enormous mortality of the soldiers employed in their erection. During July and August of the present year the death rate was said to average four or five a day, and this out of a total strength not exceeding 1,500 men, many of whom when landed a month or two previously were in good health and of average physique. Complications such as diarrhœa or dysentery were exceptional; in almost every case I saw, obstinate constipation was the rule, not infrequently of five or more days' duration. In fatal cases the disease ran a short course, often hastened by carelessness on the part of the patient, who, when severely attacked, would lie down by the wayside exposed to the rays of the sun; while others, during the heat of the night, would crawl from their huts to seek relief in the cooler but not less injurious atmosphere outside.

Another fact that points to the probability of these earthworks exercising an injurious influence on the health of the community is the number of cases of fever that have, during the present summer, occurred on board ship. One or two patients would often be found on board a vessel which had lain at anchor outside the bar during the night or early morning, the symptoms

commencing at once, or two or three hours after arrival in port. In some cases the patient had not previously suffered from fever. An officer on board one of the steamers was attacked on three successive visits when nearing the port, even although during this period and for some time previous he had not been on shore. Doubtless in all cases, carelessness in regard to damp clothing, undue exposure to the sun, etc., often induce an attack in one who is subject to the malarial influence.

The treatment is often difficult, owing chiefly to the fact that we have no place to which patients can be removed during the course of the sickness. The whole northern part of the island is more or less malarious, and unfortunately there is in the neighbourhood no healthy house that might be used as a sanatarium. As a consequence the patient has to remain subject to the same influences as produced the attack. No one would expect to treat a typhoid patient with any degree of success so long as he remained exposed to the poisonous effluvia from the soil-pipe which generated the disease. Here, as regards malarial fever, there is no option. A change to a non-malarious district would be invaluable. Even removal from one part of the island to another will often exert a favourable influence in obstinate cases, although the latter spot may be quite as malarious as the former. A parallel circumstance is observed in certain forms of asthma; a man who is a martyr to this affection may lose it entirely in the very place dreaded by a fellow-sufferer. No doubt, if it can be accomplished without fatigue, removal is highly beneficial, especially if the patient is exposed to a sea breeze. The only reliable safe-guard seems to be residence in two-storied dwellings. This statement, the truth of which is now generally admitted, is favourably supported by observations confined to this locality during the past summer.

Taking the foreign residences in the three communities of Tamsui, Twatutia and Kelung, in all of which malaria is endemic, there are :—

10 one-storied dwellings, with 18 adult occupants.
11 two-storied „ „ 16 „ „

With two exceptions every individual of the former class has suffered from one or more attacks of fever, while among the latter no single case has been reported. The number of fresh arrivals at the port has been about equal in the two classes. In two of the one-storied houses are several children who have almost all been sick from fever. The social position of the occupant does not affect his liability to be attacked. The better situation of his house may to a certain extent favour him, but the fact that no one-storied house, whatever its structure and position, whether high or low-lying, has conferred immunity on its inmates is presumptive evidence that such a dwelling is not reliable. From their low-lying position, and situated as they are in the immediate vicinity of paddy fields which lie on a higher level, the quarters of the Out-door Customs Staff render their occupants especially liable to the disease. These have suffered by far most severely both in the present and former seasons. The buildings are in every respect good, but one-storied.

Statistics are at the best misleading, and especially so when gleaned from such a small field of observation as is here presented; but when it is noted that during a period of several years certain dwellings have secured to their successive occupants immunity from endemic disease, while in others new-comers have with few exceptions been attacked within a few months of arrival, the connexion of events is removed from the region of mere supposition. When one considers the amount of trouble that malarial fever causes, the time the patient is unfitted for business at the very season when his absence can be least spared, and his liability to attacks in

after years and in more favoured places, the proper construction or reconstruction of our houses is under existing conditions a matter not to be lightly overlooked.

In every other respect the climate is as healthy as could be desired. No other disease has been reported that could in any way be attributed to climatic causes.

Among the natives small-pox and cholera have prevailed as usual, but with slight severity as compared with last year. For the former disease vaccination is being extensively practised by the native doctors. We have one death to record. This occurred at Kelung.

On the morning of August 20th a messenger arrived with a letter stating that the Examiner in the Customs Service there had died rather suddenly at 7 o'clock the previous evening. The letter also stated that interment of the body would take place on the day subsequent to death, *i.e.*, on the same day as the messenger arrived. The following are the symptoms and history of the case as afterwards collected :—

On the 14th of August deceased complained of pain in the left breast, and of a tired feeling which he attributed to the great heat. His appetite was bad. The pain, by no means severe, continued until the 16th, when it shifted to his bowels. Being somewhat constipated, deceased took a couple of COCKLE'S pills, and for food a little sago. On the 17th, the pills having acted but slightly, he took a dose of castor oil, and nothing in the way of nourishment but milk and soda water.

On the 18th deceased felt bilious, and being by no means satisfied with the amount of evacuation secured by the aperient medicines previously taken, swallowed a dose of compound senna mixture in the morning and a little quinine in the evening. Took no food but drank soda water.

Up to the morning of the 19th deceased had been performing his usual duties, but at that time, after noting the readings of the thermometers, he returned to bed. He complained that the medicines previously taken had not sufficiently relieved him, and that he still experienced a "*feeling of stoppage* of the bowels," to relieve which he took two podophyllin pills. During the day he drank a little rice water. At 3 P.M. he went to stool, but it is doubtful whether any motion was passed. Slight bilious vomiting had occurred during the 16th, 17th, 18th and 19th. At 7 P.M. deceased said he felt feverish, and getting out of bed drank half a wineglassful of brandy and water with quinine; almost immediately he threw up his arms, with the exclamation that his stomach was burning; gasped twice for breath and expired. Up to the moment of his death he said he did not feel particularly unwell, and did not think it at all necessary to summon medical aid.

The cause of death from the above symptoms is somewhat obscure. At first sight one would be inclined to suspect irritant poisoning, but the quinine solution from which deceased took his last dose I found to be a solution of quinine in dilute sulphuric acid which I had prepared for him some weeks previously, and which his wife states she has administered to the children since the death of her husband. The history and symptoms point to an abdominal lesion as the cause of death. Two possible lesions are suggested :—

1. Intestinal obstruction, terminating by perforation or rupture of some portion of the gastro-intestinal tract.

2. A vascular tumour of the abdomen, probably aneurism of the abdominal aorta, terminating by rupture of the sac.

The former supposition is supported by pain referred to the abdomen, by the feeling of stoppage of the bowels, by the vomiting for four days and ultimate severe abdominal pain; but negatived, I think, for two reasons: (*a.*) the pain and constitutional disturbance were not of such intensity as would be attendant on a case of intestinal obstruction terminating fatally, evinced by the fact that patient could move about to the day of his death; (*b.*) it is highly improbable that perforation of the bowel, in a case presenting so few symptoms of severity, would produce death so suddenly. The patient as a rule lingers for several hours, although cases are on record where death has been instantaneous, shock being produced just as by a blow on the abdomen.

I am inclined to accept the second supposition. The intense burning pain and sudden dissolution quite harmonise with the symptoms occurring on rupture and escape of the contents of an aneurismal tumour. Apart from the possibility that the tumour may have been of sufficient size to cause pressure on the bowel, it is just possible that a certain degree of obstruction may have co-existed. The increased blood pressure from this condition, aggravated by the persistent use of ineffectual purgatives, would undoubtedly favour the fatal result. The deceased, aged 46, had been a remarkably healthy man. When I saw him about two weeks previously he looked so well that the idea of examining him did not suggest itself to me. For the last six years he had not had occasion to consult a medical man. I communicated with the gentleman who last examined him six years ago, but he knew of no physical signs bearing on the matter.

A postmortem examination, however much desired, was impossible. The nine hours requisite to traverse the distance of 32 miles precluded any chance of arrival before interment, which, owing to the hot weather, could not be deferred. In the absence of this solution of the question, the real cause of death must rest conjectural.

Appended is an abstract of the meteorological observations kindly supplied by Mr. Harbour Master McINNES :—

MONTH.	THERMOMETER.				BAROMETER.		RAIN.	
	Highest Reading.	Average Highest.	Lowest Reading.	Average Lowest.	Highest.	Lowest.	No. of Days.	Rainfall.
	°	°	°	°	*Inches.*	*Inches.*		*Inches.*
April	85.0	75.5	56	63.7	30.27	29.88	15	8.78
May	90.0	83.0	57	70.0	30.18	29.84	3	0.82
June	91.0	81.0	60	67.5	30.15	29.58	18	11.89
July	96.5	90.5	74	76.0	30.14	29.76	5	2.19
August	93.0	89.0	71	75.5	30.07	29.41	12	5.93
September	92.0	82.5	63	71.0	30.17	29.79	14	13.93

DR. B. S. RINGER'S REPORT ON THE HEALTH OF AMOY

For the Year ended 30th September 1886.

THE cool and pleasant weather of the winter season of 1885 soon dissipated the various diseases and ailments of the summer, and the Amoy community for the most part again enjoyed excellent health during the 12 months now under review.

Three deaths have to be reported, viz., one from alcoholism, one from chronic diarrhœa, and one from aortic disease.

The last case terminated suddenly, and at a postmortem examination the aortic valves were found to be incompetent, the cusps being thickened, contracted and somewhat atheromatous in patches. A complete ring of osseous deposit surrounded the aorta immediately above the valve, and was about ¾ of an inch in width, mostly bare of epithelium and formed an unyielding wall to the vessel.

Twelve births took place, the presentation in each case being natural.

During the summer a considerable number of cases of diarrhœa and some of acute dysentery occurred, which were for the most part amenable to treatment, though a few proved more obstinate. Recovery, however, eventually took place in all. The excellent supply of milk obtainable throughout the year at the dairy here was a most valuable supplementary aid to medical treatment.

Malarial fevers were not numerous this year, though one or two serious cases were attended.

Boils were very troublesome during the hot months, and one dangerous case of carbuncle in the lower part of the back was treated; the sloughs were long in separating and convalescence was much protracted but was eventually complete. The wound was treated throughout with iodoform in powder and ointment.

Scarlet Fever.—An outbreak of scarlet fever took place towards the end of the year 1885, but was fortunately limited to a small number; and as this is the first instance in which I have treated the disease at this port, and, indeed, as far as I have been able to find out, the first time any record of its occurrence here among foreigners has been made, I purpose tracing the history of its introduction upon this occasion.

Towards the end of the summer of 1885, a gentleman with his wife and family left this port for Chefoo, where they spent the autumn. In October the children went to a juvenile party, a few days after which one of the little girls complained of feeling feverish, had sore throat, and was subsequently covered with a red rash which lasted five days, when all the symptoms ceased and the patient became quickly convalescent. From what followed I believe the attack, briefly described to me by the parents as above, to have been a mild case of scarlatina. On the 1st November the family returned to Amoy, and I was called in to see the eldest daughter, who had felt sick and generally miserable during the voyage, and found her very feverish; skin hot and dry; face flushed; tongue covered with white fur; a bright red rash on the legs and body; the throat was very sore, both tonsils being much enlarged and deeply congested, with some patches of viscid mucus adhering to them.

Low diet, a simple saline mixture and a gargle of salt and hot water were ordered. The patient passed a somewhat restless night, and in the morning her temperature was 103°.5 F., pulse 120, but the throat was less painful. Throughout the course of the disease the patient progressed favourably, all the

symptoms gradually disappearing, and on the 9th November she was pronounced convalescent. Desquamation of the skin of the hands took place. No albumen was found in the urine. The tonsils, however, remained enlarged and have continued so on and off to the present day, being easily affected by changes of temperature. Before the end of November, the mother, three more of her children and two young ladies staying in the house all took the disease. The symptoms were for the most part mild.

The most severe and typical case occurred in the person of one of the guests. In this case the temperature rose to 104°; the strawberry tongue was well marked; sloughing of both tonsils took place; an abscess formed beneath the angle of the jaw on the left side, which was eventually opened, the patient recovering perfectly, though convalescence was very prolonged.

All the patients recovered, and indeed one or two of the cases were of so mild a character that had I seen either of them separately, without any previous history and with the knowledge that the disease had not appeared, in my experience, here before, I should certainly have hesitated before pronouncing it a case of scarlatina. But the series of cases taken as a whole and the typical characteristics in the one last noted at once remove all shadow of doubt. Certain careful sanitary measures were advised and carried out, and for a time the cases were confined to the numbers before mentioned; and I was of opinion that all probability of the contagion spreading had long since ceased when a circumstance occurred which I am still unable to account for satisfactorily to myself.

On 22nd March 1886, more than three months after the last of the scarlatina cases reported above had become quite convalescent, I was called in to see a lad 12 years old; and on arrival found he had been feverish for several days, and had complained of sore throat. His face was flushed; his skin hot and dry; a bright red rash was visible on the arms, legs and body, particularly well marked at the flexures of the joints; the tongue was covered with a thick white fur in the centre, while the tip and edges were bright red; the fauces were swelled and inflamed; and there was a tender cervical gland on the left side. Temperature, 101°.5; pulse, 120. The next day the rash was more marked; the left tonsil was ulcerated in several places; and the tongue began to assume the strawberry character. The case was clearly one of scarlatina. It ran a mild course; the temperature was never observed to be over 102°. Chlorate of potash was used as a gargle, and the throat healed; the tenderness of the gland disappeared; the rash faded in due time; desquamation commenced on the 29th March; no albumen appeared in the urine, and the patient gradually became convalescent.

Towards the end of April a younger brother took the complaint, the mother being probably the medium of contagion. This case was somewhat more serious than that of the elder brother, the temperature rising to 103°.5 and the pulse to 136, with considerable cerebral excitement, the child wandering a good deal in his conversation and having very restless nights. These conditions passed off, however, in a few days, and on the 12th of May convalescence was complete.

These two boys, with their mother, who had nursed them both throughout their illness, were now carefully isolated from the rest of the family for six weeks. The house being large and having an upper story and the weather being warm, isolation and hygienic measures were easily and most carefully carried out. At the expiration of the allotted time the children and mother again associated with the other children (three in number), and up to the end of September no sign of the disease has appeared either in that family or any other in the community.

Now the point which seems to me somewhat curious is, that the two families in which the outbreak occurred are quite unacquainted with one another and none of the children had ever been known to speak to each other. Also, before the second outbreak fully three months had elapsed without any other case having occurred in any member of the foreign community.

DR. J. H. LOWRY'S REPORT ON THE HEALTH OF HOIHOW (KIUNGCHOW)

For the Half-year ended 30th September 1886.

FROM notes kindly left me by Dr. ALDRIDGE, I gather that the health of foreigners resident here has on the whole been satisfactory during the summer; and for the months of August and September I myself can speak, inasmuch as I have not had a single case on the sick list. April seems to have been an unhealthy month, many suffering from malarial fever. One case of remittent diarrhœa occurred, and proved obstinate. One case of dysenteric diarrhœa was also treated.

From what I can learn, the general health of the native population has not been bad. A certain amount of diarrhœa has been prevalent, but not of a fatal nature. There seems to have been an epidemic of chicken-pox among children. Several cases of attempted suicide have been brought to my notice, chiefly opium-poisoning. Dr. ALDRIDGE, previous to his departure, treated successfully a coolie, employed at the Custom House, who had taken 2 mace of prepared opium. In the month of May a sampan-man drank a quantity of kerosene oil, with suicidal intent, but eventually recovered.

With the exception of the month of September, severe thunder-squalls, accompanied by heavy rain, have been almost a daily occurrence.

ABSTRACT of METEOROLOGICAL OBSERVATIONS taken at the Custom House by Mr. Harbour Master MÜLLER, for the Six Months ended 30th September. Latitude, 20° 3′ 13″ N.; Longitude, 110° 19′ 3″ E.

MONTHS.	WIND.							BAROMETER.		THERMOMETER.		No. of Days Fog.	No. of Days Rain.	Rainfall in Inches.
	No. of Days N. to E.	No. of Days E. to S.	No. of Days S. to W.	No. of Days W. to N.	No. of Days Variable.	No. of Days Calm.	Average Hourly Force.	Highest.	Lowest.	Highest.	Lowest.			
							Miles.	*Inch.*	*Inch.*	°	°			
April	7	11	...	...	12	...	2	30.15	29.80	89	76	2	1	3.40
May	3	20	...	1	7	...	2	30.10	29.81	88	73	1	2	5.70
June	5	13	1	...	11	...	2	30.00	29.70	92	79	1	2	5.20
July	1	23	...	...	7	...	2	29.98	29.70	94	79	...	1	8.40
August	...	10	2	...	19	...	2	29.97	29.69	90	80	1	19	5.40
September	16	2	1	2	9	...	3	30.10	29.81	87	75	...	6	1.70

DR. T. RENNIE'S REPORT ON THE HEALTH OF FOOCHOW

For the Year ended 30th September 1886.

During the year there were few cases of serious illness, and until the close of the twelve months the general health of foreign residents was remarkably good. There were seven births and two deaths.

Of the latter, one was caused by heat apoplexy and the other death was due to chronic pulmonary phthisis.

Throughout the year the diseases most prevalent among the foreign community were of malarial origin. In December, March, April and May there were several cases of intermittent fever. In August and September there were no fewer than 25 cases (about 10 per cent. of the foreign community) of malarial remittent fever, besides a few cases of intermittent fever and masked malaria. In December there were three cases of dysentery, and again in August and September there were seven cases of this disease.

In February coryza, bronchial catarrhs and mild cases of muscular rheumatism were very prevalent.

In May two mild cases of typhoid fever were treated, and they were the only cases of this disease met with during the year. In June, July and August diarrhœa was of frequent occurrence. The boil season commenced in July and continued till the end of September, some of the afflicted having as many as three crops of them.

The general type of disease was mild. Malarial fevers, especially in August and September, were of the frank remittent type, lasting about five days; and although during the exacerbation the temperature usually reached 104° or 105° F., there were no serious complications. Quinine by itself had but little influence on the course of the fever, but when combined with salicylic acid proved very efficacious. Diarrhœa was of a most tractable nature, and dysentery readily yielded to the usual treatment by diet and ipecacuanha.

Although the weather was frequently cool and pleasant during the first three months of the period reported on, there was very little cold weather till the middle of January; after this followed six weeks of the coldest weather experienced by the oldest resident. On 30th January the surrounding hills were capped with snow. Frosts at night were frequent, and on the forenoon of 1st February, ice, $\frac{1}{8}$ inch in thickness, covered the wet portions of the rice fields. Hardy trees and shrubs from warmer climates that had survived many previous winters succumbed to the strong frost. In spring the weather was rainy, and the temperature, as usual, variable. Through the summer the rainfall was heavier than in recent years. Only on a few days did the temperature exceed 90° F., but the atmosphere was unusually damp and muggy. Bright, warm, dry days, tempered by cooling southerly breezes, were very infrequent.

For the following extracts from the Pagoda Anchorage Customs meteorological tables I am indebted to Mr. J. VON JEZEWSKI, the Tidesurveyor.

METEOROLOGICAL TABLE.

MONTH.	WIND.					BAROMETER.				THERMOMETER.					WEATHER.		
	No. of Days N. to E.	No. of Days E. to S.	No. of Days S. to W.	No. of Days W. to N.	No. of Days Calm.	Highest by Day.	Lowest by Day.	Highest by Night.	Lowest by Night.	Max.	Min.	Mean.	Averages.		No. of Days Rain.	Rainfall.	No. of Days Fog.
													Wet Bulb.	Dry Bulb.			
1885.						*Inch.*	*Inch.*	*Inch.*	*Inch.*	°	°	°	°	°		*Inch.*	
October	17	3	3	6	2	30.290	29.960	30.290	29.950	81	58.0	69.50	66.50	71.00	3	0.41	1
November	16	2	3	6	4	30.648	30.012	30.650	30.052	79	45.0	62.00	59.50	67.50	5	1.03	1
December	18	3	1	6	4	30.656	29.900	30.600	30.010	76	42.0	59.00	53.50	57.50	9	1.37	3
1886.																	
January	16	5	1	6	3	30.600	29.942	30.602	30.032	60	35.0	49.00	46.00	51.00	6	1.97	1
February	17	6	1	2	2	30.578	30.018	30.662	30.070	61	31.5	46.25	43.25	47.25	8	2.82	1
March	17	5	3	3	4	30.432	29.820	30.448	29.886	82	39.5	60.75	56.25	62.50	8	3.46	4
April	15	8	2	3	3	30.316	29.910	30.362	29.964	84	50.0	67.00	62.00	65.50	5	5.98	2
May	15	7	4	1	4	30.252	29.850	30.364	29.820	90	58.0	74.00	69.25	75.25	6	4.12	...
June	10	6	9	2	5	30.140	29.658	30.142	29.636	91	62.0	76.50	72.00	76.25	9	11.02	...
July	6	8	10	5	3	30.084	29.735	30.221	29.820	97	73.0	85.00	78.25	84.75	3	5.00	...
August	10	3	11	6	1	30.100	29.394	30.082	29.435	97	69.0	83.00	77.00	82.50	...	8.58	...
September	17	4	2	6	2	30.260	29.856	30.300	29.792	92	63.0	77.50	75.00	77.75	3	2.87	...

Thunderstorms commenced early in March and were of frequent occurrence throughout the summer. In the settlement, between the 14th and 18th August, about seven inches of rain fell. On 17th August the river commenced to overflow its banks, and a freshet, unheard of at this season and second in magnitude within a period of 50 years, resulted. Two days after the flood commenced it reached its highest point, just three inches lower than the spring flood of 1877. The surrounding plains were submerged, and many of the houses, both of Europeans and natives, in low-lying parts of the settlement, were flooded. In large portions of the city and its suburbs the flood was so severe as to cause the natives to seek refuge on their housetops. Soon after the freshet reached its highest point it commenced to subside, leaving behind it a coating of mud. Vague reports of much suffering and great loss of life among natives, as the immediate effect of the freshet, were current; but judging from the general unhealthiness and number of deaths that succeeded the inundation, its secondary results would seem to have been by far the more fruitful cause of suffering and loss of life. Early in August, while natives were manuring and stirring up the soil about the roots of their second rice crop, there was as usual some malarial fever among Europeans and natives living in proximity to the paddy fields, but it was not until after the flood had subsided that malarial diseases

became so unusually prevalent among all classes. For a few days after the heavy rainfall the weather was bright and clear, but the atmosphere soon became humid and charged with all sorts of impurities. Effluvia generated from débris left by the flood pervaded the settlement and neighbourhood. Sometimes smells arose from immense quantities of putrid fish and some other almost equally foul-smelling articles that had, after submersion for some days, been scattered over the hills to dry; while in many instances smells proceeded from the graves of recently interred natives which had been either flooded in the valleys or saturated on the hillsides by the heavy rains. That such a condition should have caused much unhealthiness is not to be wondered at. In all probability this state of atmosphere was the cause of heat apoplexy in the case which proved fatal on 1st September and hastened death in the phthisical patient.

The subject of chronic phthisis was a Spanish nun, 23 years of age, who had resided for a little over three years in Foochow. On arrival, there were well-marked signs of disease in the apices of both lungs. Every spring the disease assumed an active form, but became quiescent in summer and winter. In the present year the active spring stage having passed by, the patient was able to perform her usual duties till the end of August, when an acute attack came on, and night sweats, diarrhœa, hectic fever, rapid loss of flesh and strength brought on exhaustion and death on 24th September.

In December an unusually severe case of variola, after revaccination, came under my care.

The patient, a middle-aged lady, had, two days prior to the onset of sickness, arrived in a steamer that had come direct from Nagasaki, where small-pox was epidemic. On 10th December illness began with rigors, headache, lumbar pains and vomiting, followed by feverish symptoms which compelled her to go to bed. At noon on 15th when I first saw the patient, she was in a state of stupor. The thermometer registered 105° F. in axilla; and during the afternoon, in spite of several doses of quinine and salicylic acid, and tepid sponging, the temperature gradually rose till it reached its highest point, 106°.5, at 7 P.M., when profuse perspiration set in. On the following morning the temperature was 101°, and an eruption of closely-packed papules had come out on the face, hands and wrists. On 17th a discrete eruption appeared on the rest of the body, and temperature had almost become normal. Vesicles began to form on the face; and sore throat, caused by vesicles scattered over the mouth, pharynx and larynx, was complained of. As vesicles appeared on the face and hands, they were punctured, and a solution of nitrate of silver (grs. xx. ad ℥i) applied. On the 18th there was headache and increase of fever. On the 19th the face and hands were much swollen, the nares were stuffed up and the throat caused much discomfort. On 21st fever symptoms disappeared, convalescence set in and proved uninterrupted. When the crusts had fallen and desquamation had ceased, there was almost no pitting where the vesicles had been punctured and the solution of nitrate of silver applied. On the patient's left arm there were two well-marked vaccine cicatrices, and she was said to have been revaccinated a short time previously. The patient's maid, a young Englishwoman, having only two indistinct vaccination marks on the left arm, was revaccinated on the morning of 14th December. On the 21st three perfect vesicles had formed, and, although she was the sole nurse during her mistress' illness, she escaped infection.

At the spring races, about the middle of April, one of the riders met with rather a severe accident.

In one of the races the leading pony, under the influence of some sudden fright, rapidly dashed through the rails, breaking its rider's leg against the top of a post. Immediately on breaking through the rails the pony's progress was abruptly arrested by its fore feet getting into a muddy ditch, and this sudden arrest of motion caused the rider, with his broken leg, to perform a somersault before he reached the ground. After the accident he was found lying on his back somewhat under the influence of shock.

After being carried home and clothes removed, it was found that a little below the middle of the leg both bones were broken. The fracture of the tibia was very oblique, the direction being downwards, inwards and forwards. There was considerable displacement of the upper fragment, and the lower portion of the tibia was slightly drawn upwards. The skin, to the extent of a square inch and a half over the lower end of the upper fragment, was bruised and discoloured. On the outer side of the limb, about half an inch higher than the seat of fracture, a wound commenced which ran upwards for about four inches, and through this wound a rounded mass of lacerated muscle protruded. This laceration was in all likelihood produced by the sharp end of the lower piece of tibia while the rider was jerked heels-over-head from the pony. Under chloroform the wounds were cleansed with a strong aqueous solution of carbolic acid, the displaced fragments were brought into apposition and the limb placed in NEVILLE'S splints with swing, which, considering the amount of bruising and laceration of the soft parts, seemed the most suitable apparatus. The bruised skin was cleansed and coated over with a little salicylic wool and collodion, and the large flesh wound, after being surrounded with carbolic putty to prevent discharges from passing between the leg and the splints, was dressed with salicylic wool.

The patient was 32 years of age, and had resided in China for nine years. During his residence in the East he had occasionally suffered from diarrhœa, but on the whole had enjoyed good health, and had never, by illness, been confined to bed. At the time of the accident he had diarrhœa, and his digestive organs were by no means in good order. During the first week after the accident he had a mild attack of dysentery, much fever and was very restless. In the course of the next week pus commenced to collect under the collodion, and necessitated its removal. The bruised skin was found to have sloughed, and on being taken away left exposed a splintered portion of the internal surface of the tibia, just above the fracture. Subsequent attacks of disordered digestion and diarrhœa, together with the accession of the warm weather, rendered the healing process slow and prevented a change of apparatus till the beginning of July. Then bony union seemed pretty strong, and after removing some loose fragments of bone the limb was placed in plaster of Paris, in which holes over the sores were made. In the beginning of August, when the plaster of Paris was cut off, the bones were firmly united in excellent position, and healing in the soft parts rapidly followed.

At the winter race meeting in December 1884 an accident in some respects similar to the case just recorded occurred.

The bones of the left leg were broken, about the same site and in the same manner, by being brought violently against the head of a post, but at the time of the accident the soft parts were not injured. It was only after the fractured bones had united that the skin broke and gave exit to some fragments of splintered bone.

The difference in the two accidents was, I think, due to the manner in which the two riders were thrown after their legs had been fractured. In the accident of last spring the mode of fall has been already described, and in the present instance the pony's near thigh caught so firmly on the top of one of the rail-posts that he fell on his right side, shooting his rider off with comparatively little force on the uninjured right side. Delayed union in this case was without doubt due to a low state of vitality, produced previous to the races by starving the body down to a point considerably below the natural average weight—a process very injurious to the system, and not to be lightly undertaken.

Among natives the chief cause of death during the year was cholera. It occurred sporadically in August and September of last year, became epidemic in October and raged with varying degrees of activity until the beginning of December, when it began to decline. By the end of December the epidemic was over, and since then cholera has not been met with. This epidemic is said to have been as fatal as that of 1883; and judging from the cases that came under my observation, the tales of coffin-makers and the number of recent graves on

the hillsides, the reports would seem to have been correct. Although there were many deaths from cholera among native servants in foreign employ, none of the foreign community suffered. On several occasions I heard of natives from the country employed in the settlement, being affected with cholera, rushing off to their homes and letting loose the disease in their respective villages. As an example of this I may quote what occurred in my own household.

A boy, 13 years of age, who had retired to rest in good health on the evening of 8th November, was seized at 5 A.M. on the following day with diarrhœa, nausea and much exhaustion. My head servant, taking the malady to be cholera and dreading the trouble that would befall him should the lad die while under his care, procured a chair and, by 6 A.M., had the sick boy sent off to his home. Previous to departure a hypodermic injection of morphia had been given and he was provided with stimulant cholera-drops. In an hour and a half home was reached. Rice-water vomiting and purging and cramps of the muscles of the extremities followed. At noon the stage of collapse was reached. Strong fever, accompanied by delirium succeeded the collapse stage, and five days from the commencement of illness the boy died. At his home, previous to his arrival, there had been no cholera, but while he was ill and before he died four female inmates of the house were seized with the disease and two of them died after an illness of about six hours' duration.

A mild epidemic of measles occurred in spring, and some cases of mumps were met with in the autumn.

In May I saw two well-marked cases of beri-beri in natives of Canton. They were at once sent off to their homes, where, I have since heard, they recovered.

In the beginning of June, in the Church Mission Divinity School, a native died of beri-beri.

Deceased had been ill for about six weeks, his chief ailments being præcordial uneasiness with palpitation on exertion, much debility, numbness of lower extremities and general œdema. As he had recovered from a similar illness in the previous hot season he did not think seriously of his present state, but hoped that with some relaxation from study he would soon recover. On the evening of 6th June, however, he suddenly became very ill and died during the night. After this man died it was noticed that 15 students in the same school were suffering from a chronic form of beri-beri. Sallow-white chlorotic looking faces, general œdema, numbness down the front of lower ends of thighs and front of legs, hyperæsthesia of the muscles of legs and thighs, tumultuous action of the heart and general languor were the symptoms. All were upwards of 20 years of age. Three had staggering gait in walking, and several of them complained of præcordial uneasiness, palpitation on exertion and dyspnœa. The students were supplied with Epsom salts, to be taken in large doses in the morning, and sent off to their homes in hilly parts up country. Unfortunately the Foochow native hospital was accidentally burned down in May, else we might have seen more of this disease.

While cholera was raging among the natives, cattle plague was epidemic among their cattle. With the symptoms and fatal nature of this bovine malady the people are very familiar. They sometimes call it the "periodical sickness" (時症), because every few years it is very prevalent; but the usual name is the "swollen gall-bladder fever sickness" (脹胆熱症). This latter name is given to the disease because during life pyrexia is a universal symptom, and after death a very much distended gall bladder is the most obvious morbid appearance. In the neighbourhood of Foochow it is the invariable custom among native dairymen and owners of cattle, when this disease appears among their herds, to slaughter animals as they become affected. This they do not with a view to stamp out the disease but to avoid

pecuniary loss. The carcass of an animal that has been allowed to die, though consumed by natives as food, realises a very low price; whereas animals that are slaughtered at an early stage bring almost the price of healthy animals. Native butchers say that the flesh of animals killed early differs in no respect from the flesh of the healthy. Were the custom of killing animals as they become affected universal, epidemics would soon be stopped; but in sparsely populated country districts, whence the native dairies are replenished, it is difficult to dispose of large carcasses at any price, and, as no pecuniary advantage is to be derived from early slaughter, diseased animals are left to die, and the disease allowed to lurk about the country. Every autumn it is said to occur sporadically, and occasionally to become epidemic.

In the autumn of 1879 I inspected the abdominal viscera of two Australian cows that had been in Foochow for some years, and had just died after a brief illness, in which diarrhœa and exhaustion were said to have been prominent symptoms. The gall bladders of both animals were distended with altered bile, their paunches were packed with hard masses of food; and appearances in the intestines, mesenteric glands and spleen led me to think that an analogy existed between the disease and typhoid fever of man.

The mortality among Australian cows imported from time to time has been very heavy. I have frequently been told of animals dying after a brief illness, of postmortems being held, and of paunches blocked with hardened aliments pronounced the cause of death; but foreign-bred cows readily eat and thrive well on native grasses, and I think that the periodical heavy mortality among cows imported from Australia was due to cattle plague and not to feeding on poisonous or indigestible foods, as some have suggested. In 1879 and in 1883 the native dairies were cleared by disease; but although I had heard much of the malady and its symptoms, I saw very little of it until the autumn of 1885.

A little over two years ago, in order to procure for the foreign community a supply of pure milk, a foreign dairy was started, and it was, unfortunately, in this establishment, last autumn, that I had an opportunity of observing the symptoms of cattle plague.

At the beginning of September 1885 the dairy stock consisted of 12 cows, 1 bull, 9 heifers, 1 calf, all of foreign breed, and 1 native cow with calf—in all 25 animals. Four of the cows had been imported from Australia more than four years ago, four had been in Foochow about one year, and the rest were bred here. The arrival of some cows from Australia was expected. Towards the end of August and in September cattle plague was prevalent in native dairies, and the affected animals were disposed of in the customary way. On visiting the foreign dairy on 4th October I saw a large Australian cow (one of the four cows that had been about one year in Foochow) suffering from the disease. She had muco-purulent discharge from the nostrils and vagina. The conjunctivæ were deeply congested, and a watery discharge was running down the nose from the eyes. She looked very ill and dejected. The abdomen was very tumid, and she had evidently much abdominal distress. Dysenteric evacuations, whose odour pervaded the stable, were frequently passed. The evening temperature was 105°. Illness was said to have commenced on 25th September with cessation of rumination, loss of appetite, constipation and diminished secretion of milk. On 28th September she seemed very ill, and was removed to a stable by herself; and as she could eat no food, was freely drenched with *congee*. Gradually the evacuations became firmer, but contained mucous shreds and were very fœtid. Appetite began to return, and by 11th October she seemed to be well. In November this cow was again attacked, and after an illness of four days died. This was an unusual, but, I believe, not an exceptional occurrence. The symptoms of her fatal illness were loss of appetite, cessation of rumination, diminished milk secretion, running at eyes and nose, muco-purulent discharge from vagina, intense vital depression, dysenteric purging, and convulsive struggles, ending in

death. On the night of 28th September a cow (landed on 10th September from a steamer that had come from Australia *viâ* Hongkong) died. On arrival this animal, though emaciated and fatigued from the long voyage, was said to look healthy. She was placed in a stall by the side of the cow that was taken ill on 25th September, took food well and seemed in good health till 26th September, when rumination and appetite ceased. On 28th September violent purging set in, and death soon followed. After death only the paunch was examined, and as it was found full of hardened food, indigestion was supposed to be the cause of death. One of the nine heifers, all of which had been grazing on the hills among the native cattle, was taken ill on 3rd September. For three days it took no food; was on the third day of illness violently purged, and died the same evening. I was afterwards informed that the carcass of this animal was sold by a native for human consumption. The butcher who skinned and dressed the animal seemed to see nothing unusual in the proceeding. He told me that the morbid appearances met with in the heifer were similar to those met with in animals that had died of the periodical sickness.

The fourth animal that became affected arrived from Australia on 30th September, and was placed in the stall in which the cow had recently died. On arrival she looked thin but healthy, and was carefully fed on hay and sweet potatoes in order that illness from the consumption of indigestible native grasses might be avoided. On 9th September appetite began to fail, rumination ceased, bowels were constipated and milk secretion was much diminished. On the following day she looked very dull and listless with ears cold and pendent; the conjunctivæ were deeply congested, and a watery discharge ran down the nose from the eyes; a slight muco-purulent discharge proceeded from the nostrils and stringy saliva hung from the mouth. She was removed to a stable by herself. On 12th October she was lying down, breathed quickly and laboriously and had a slight cough; much muco-purulent discharge proceeded from the nostrils, and diarrhœa had set in. On 14th October she breathed hurriedly and with a groan, was apparently in much abdominal distress and passed large fœtid liquid evacuations. On the following day she died. On the three days preceding death the cow's morning temperature was 105° and the evening temperature was 106°.6.

On postmortem examination the following appearances were found. In the nasal cavities there was a considerable amount of viscid muco-purulent secretion; the mucous lining was generally of a leaden hue, with here and there small patches of diphtheritic membrane adhering to the surface; the larynx and trachea showed many deeply congested parts, and were mottled over with darkened spots; in the trachea several diphtheritic patches were noticed; the pleuræ and lungs were healthy; in the mouth were several small superficial ulcerations; on opening the abdominal cavity the viscera were much inflamed; the paunch, full of hardened food, was congested, and on its anterior aspect there was a patch of ecchymosis several inches in diameter; through the apparently healthy peritoneum large portions of inflamed bowel could be clearly seen; the mucous lining of the small intestines, covered with a viscid, yellow secretion, was of a dirty red colour with some purplish raised patches; the lower portions of small intestine were studded over with pearl-looking bodies about the size of peas and projecting equally on both sides of the bowel; the mucous lining of the large bowel was generally of a deep leaden colour; the spleen was enlarged and softened; the liver seemed natural, but the gall bladder was unusually tumid, and the bile ducts were filled with viscid frothy mucus; the kidneys were healthy.

Between the 15th October and the end of the month two heifers died. Their symptoms before death were similar to those of the animals that had just died, but no postmortems were held.

The seventh animal affected was a New Zealand cow which arrived on 5th November in a steamer that had come from New Zealand *viâ* Australian ports and Hongkong. She was placed in the stable in which the sick cows had been treated, and was fed on the food that had been shipped with her from New Zealand. On arrival she looked thin but healthy, and was followed by a fine healthy calf about six months old. On 5th November the mother seemed dull and listless, and appetite began to fail. On the following day she took no food and rumination stopped; she carried her head low, with drooping ears; the eyes were much congested; from the nostrils come a slight discharge; and she breathed quickly. On 8th November

she seemed to have much abdominal suffering, and violent dysenteric purging set in. On the afternoon of 9th she passed a large evacuation, composed of almost pure blood, and died, in a convulsive struggle, in the evening. Throughout illness temperature was never seen to exceed 103°.4. On the following morning a postmortem examination was held. Rigidity was well marked; the vulva was swollen and congested; the mucous lining of the nares was generally of a leaden colour, with granular patches of mucous membrane covered with tenacious secretion; the laryngeal and tracheal mucous linings were much congested and mottled; the lungs and pleuræ were healthy; in the mouth were some small superficial ulcers; the paunch was full of the food last eaten; the mucous lining of the small intestines was throughout intensely congested and covered with viscid mucus; occasionally livid raised spots and superficially ulcerated patches were met with; the inner surface of the large bowel, especially near the cæcum, was of a deep livid hue, and near the cæcum there were several deeply ulcerated spots; the mesenteric glands were large and of a deep purple tint; the spleen was much congested; the liver seemed to be healthy; the gall-bladder was large, and the bile ducts were full of frothy viscid secretion.

The eighth animal affected was the calf of the cow that had just died. On arrival it seemed particularly healthy. It was ailing on 10th November, and on the 11th it refused all food and seemed very ill; it was lying down with head low and ears drooping; the conjunctivæ were much congested and a watery discharge ran down its face; its muzzle was dry, and a scanty discharge came from the nostrils; respiration was hurried and laboured and it sometimes groaned. On the 12th dysenteric diarrhœa set in. In the afternoon it lay on its side with its head resting on the floor, and in the evening it died. During life the morning temperature ranged from 103°.6 to 104°.6, and the evening temperature was about 105°.6. On the morning of 13th November a postmortem examination was held. The vulva was deeply congested and superficially ulcerated; the nares were filled with a viscid muco-purulent fluid and patches of the mucous membrane congested; the larynx and trachea were much congested and filled with a pinkish froth; the lungs were congested, but both pleuræ were healthy; over the mouth there were several ulcerated spots, and roof of the mouth had a mottled appearance; on the tongue the fungiform papillæ were large and of a bright red colour; there were several ecchymosed spots on the surface of the paunch; the mucous lining of the intestines was diseased throughout; the spleen was congested, and the gall bladder distended with altered bile. On the 16th November two cows, occupying stalls adjoining the one which had been occupied by several of the previously affected cows, took ill. Up to this time affected animals had been removed from the healthy; but as there could no longer remain any doubt as to the nature of the malady the healthy animals were sent out of the infected dairy to be housed in small stables scattered over the settlement, and the dairy houses reserved for the treatment of sick cows and for pony stabling. Of the cows taken ill on the 16th, one died on the evening of the 17th, and in eight days the other was convalescent.

Between the 16th of November and the end the month some of the animals that had been sent out of the dairy were returned infected and some of them died. On 30th November two heifers, being very ill and considered to be at the point of death, were killed. Between the 6th September and the end of November the dairy had lost 15 animals, including four animals imported during that period. 13 died, two were killed and five affected animals recovered. The symptoms of all were much alike, and the symptoms and postmortem appearances of those that died corresponded in all respects with those of steppe murrain as observed by Dr. Edward Henderson, and described by him in his memorandum on that disease as it occurred in Shanghai in 1872, and agreed with all I had previously seen and heard of the endemic "enlarged gall-bladder fever sickness" of Foochow. Of the five affected animals that recovered, three had the disease in a mild form. Their temperature never exceeded 103°; the discharge from eyes and nose was slight; bowels were only relaxed; and they did not seem to have much distress. The other two seemed to suffer more than any of those that died. In them the discharges from the mucous surfaces were very profuse. About five days from the beginning of illness masses of muco-purulent matter adhered to the lining of the nares, and large flakes of greenish purulent

matter hung from their nostrils; abdominal pain and dysenteric purging were severe; and the evening temperature was 105°. After being ill for eight days convalescence set in, and some desire for food returned. Four of the five animals were pregnant and, before recovery was complete, lost their calves by abortion. Some time after recovery patches denuded of hair in various parts of their skins were noticed.

During illness the sick animals were liberally drenched with congee water, to which stout was sometimes added, but no other treatment was adopted.

Three heifers bred in Foochow, one old native cow and four cows that had been imported more than four years ago escaped disease.

An attempt was made to prevent infection from reaching three animals imported from Australia in December, but two of them caught the disease and died.

There is no doubt that the flesh of diseased animals that have been killed or that have been allowed to die is consumed by natives, but I have not seen or heard of any illness resulting from the use of such flesh as food.

As to the milk of diseased animals, it soon ceases to be secreted. It was noticed that as soon as animals became affected the small quantity of milk yielded was of a deep yellow colour and of very high specific gravity.

DR. C. C. DE BURGH DALY'S REPORT ON THE HEALTH OF NINGPO

For the Year ended 30th September 1886.

FOREIGN POPULATION.

Male adults	52
Female adults	35
Male children	19
Female children	21
TOTAL	127

Births . . . . . 3 Deaths 0

The general health at this port during the year has been fairly good. No deaths occurred; one temporary and two permanent residents died elsewhere. The cause of death in the former was diagnosed as tumour of the brain; death took place at Singapore. The cause in the two latter was cholera, which attacked them while travelling in native boats in the canals near Chinkiang. Some particulars of their illness and death appeared in Dr. WHITE'S Report on the health of that port for the half-year ended 31st March 1886.

The diseases observed among foreigners have been—

Remittent fever.
Intermittent fever, usually of the quotidian type.
Acute and chronic congestion of liver.
Diarrhœa, simple catarrhal, infantile and choleraic.
Renal calculus.
Chronic cystitis.
Bronchial catarrh.
Pneumonia.
Tumour of brain.
Persistent eructation.
Conjunctivitis, catarrhal; phlyctenular.
Corneitis, ulcerative.
Asthenopia, accommodative.
Middle ear, acute, chronic and purulent catarrh of.
Venereal diseases.
Traumatic orchitis.

The case in which the prominent symptom was eructation occurred in a male adult, who for some years had suffered from dyspepsia. One day in May 1885, early in the morning, he was seized suddenly with uncontrollable and noisy eructations. These attacks continued to come and go from that date; and during the ensuing six months he consulted many doctors, and tried various remedies, amongst others, acids, alkalies, hot water, strict dieting, etc. He visited Chefoo and various other localities in China without any material benefit. In November 1885 I saw him for the first time. He was then comparatively free from the attacks, which did not occur while he was alone, but directly a visitor entered the room the eructations commenced and continued more or less as long as anyone was present. During the attacks he swallowed a quantity of air, which was forcibly and noisily expelled by spasmodic

contractions of the pharyngeal muscles. These attacks had no relation to time of taking food, or to its quantity or nature. Since they began he has been entirely free from any dyspeptic symptoms and has been in excellent health. Among other remedies I tried cocaine, chloroform and electricity. The latter seemed to give good results, inasmuch as he was almost free from any trouble for two or three weeks; but after that it returned with all its old violence, till finally the patient, feeling unfit for work, left for England.

The diseases most common among natives were intermittent fever, mostly of the quartan type; fevers of a low nervous type generally proving fatal; small-pox; measles; intestinal catarrh; bronchitis; a few cases of cholera; eye and skin diseases of every kind and variety.

With the kind assistance of a member of the Church Missionary Society I was enabled to open a dispensary for natives, and, later on, a hospital.

In contrasting the dispensary cases here with those in Western climates I noticed—

1. The large amount of skin disease, general not local, which would form an interesting field for investigation if the patients could be persuaded to attend regularly.

2. In eye diseases far the larger number were cases of granular conjunctivitis with all its results —entropion, trichiasis, distichiasis, pannus and ulcers of cornea; strongly reminding one of an Irish dispensary, where the same state of things exists. Diseases of lens and fundus were scarce, and up to the present I have not met with a case of glaucoma. There were two cases of cyclitis; both of the patients refused to allow enucleation.

3. The prevalence of malarial poison and its results, especially enormously enlarged spleen.

4. Elephantiasis, of which I have seen several cases.

5. The large number of cases of anæmia, nearly always occurring in women, due to various causes.

Relation of Disease to Local Conditions.

In considering this point my attention is continually drawn to the close proximity in which we live to large quantities of decomposing human fæces. Our conditions are briefly as follows. We live in houses near large kongs filled with old and putrefying fæces, the accumulation of months, especially during the summer, when manure is not wanted for the fields. In spring and autumn it is removed in boats which are loaded and travel in the canals, where the natives wash their rice and vegetables. I have often seen women doing this within a few feet of a night-soil boat. On the banks of the canal, on which the largest traffic of these boats occurs, is situated the dairy which supplies most of the foreigners with milk, and in this canal the dairy folk wash all their utensils. Every sanitary precaution deemed necessary at home against the spread of disease is utterly neglected here. No precautions are taken with the excreta from cholera or from fever patients. One is led to the conclusion that even if the pythogenic theory of the origin of typhoid fever be a right one, it is not universally applicable; if it were, the disease would rage here, for everything to favour fæcal decomposition exists—warmth, stagnation, accumulation and partial seclusion; yet no case of typhoid fever has occurred for many years among foreigners, and it is an extremely rare disease among natives. Dr. Barchet, during his 20 years' residence here, has not known of a case occurring in a

foreigner. Before leaving this subject I am glad to be able to say that a scheme for much needed sanitary reform is under way, and I trust will before long be in thorough working order.

Several cases of elephantiasis came under my notice.

Measles commenced in the spring and did not, as usual, subside during summer; even still there are many cases in outlying villages. The mortality has been high.

Before finishing this Report I should like to say a word or two about Dalansan.

It is situated some 2,000 feet above the level of the sea on a huge plateau, surrounded on all sides by the most beautiful hills and valleys, the scenery, in the opinion of some, being equal, in many places, to Japan. The thermometer readings are on an average 8° to 10° F. lower than in the plains, and the nights are always cool. During last summer some foreign children suffered from ague while residing there. With these exceptions all the visitors benefited greatly by their stay. The journey is rather trying in summer, it being necessary to travel for a few hours in the middle of the day in covered boats or chairs. Altogether the journey takes 14 to 17 hours.

I can strongly recommend it as a summer health resort, especially during September, when one can be out of doors all day long with safety.

In conclusion I wish to express my thanks to Dr. BARCHET, who kindly gave me most of the information about the diseases prevalent among natives.

DR. ALEXANDER JAMIESON'S REPORT ON THE HEALTH OF SHANGHAI

For the Half-year ended 30th September 1886.

ABSTRACT of METEOROLOGICAL OBSERVATIONS taken at the Observatory of the Jesuit Mission at Zikawei, for the Six Months ended 30th September 1886. Latitude, 31° 12′ 30″ N.; Longitude E. of Greenwich, 8h. 5m. 45s. *

DATE.	Barometer at 32° F.	THERMOMETER. Diurnal Mean Temperature in Shade.	THERMOMETER. Extreme Temperature in Shade.	Amount of Vapour in the Air per Cubic Foot.	Humidity, 0–100.	Ozone, 0–21.	Velocity of Wind per Hour.	Mean Direction of Wind.	Total Evaporation during Month.	Total Rainfall during Month.	REMARKS.
1886.	*Inch.*	° *F.*	° *F.*				*Miles.*		*Inch.*	*Inch.*	
April ... Max...	30.262 (25)	65.3 (23)	77.9 (10)	.0171 (23)	94 (3)	14 (2)	26.4 (10)				
Mean	...	56.6	...	.0116	75	10	13.4				
Min....	29.672 (10)	50.4 (12)	43.3 (29)	.0078 (26)	55 (25)	6 (6)	1.1 (12)	S. 80° E.	3.426	2.627	Twelve rainy days. Thunderstorms on the 3rd, 10th and 11th. On the 3rd, first swallows seen.
Range	0.590	14.9	34.6	...	...	...	...				
May..... Max...	30.133 (27)	76.8 (12)	86.9 (12)	.0240 (20)	96 (16)	13 (30)	43.7 (10)				
Mean	...	67.1	...	.0174	78	9	14.4				
Min....	29.598 (20)	57.0 (6)	44.2 (1)	.0092 (1)	53 (1)	6 (1)	2.9 (21)	S. 45° E.	4.328	3.730	Twelve rainy days. Thunderstorms on the 3rd and 20th.
Range	0.535	19.8	42.7	...	...	...	...				
June ... Max...	29.955 (19)	82.6 (21)	91.8 (20)	.0323 (20)	97 (28)	18 (3)	50.4 (25)				
Mean	0.465	72.2	...	.0229	84	12	12.5				
Min....	29.490 (25)	61.2 (3)	52.0 (4)	.0121 (12)	55 (12)	8 (12)	1.7 (18)	S. 40° E.	2.728	12.251	Seventeen rainy days. Thunderstorms on the 6th and 21st.
Range	0.465	21.4	39.8	...	...	...	...				
July .... Max...	29.875 (6)	88.5 (31)	98.6 (31)	.0351 (31)	92 (3)	13 (3)	41.9 (16)				
Mean	...	83.2	...	.0317	79	7	16.2				
Min....	29.541 (23)	72.1 (3)	68.4 (1)	.0247 (2)	72 (16)	4 (14)	1.4 (3)	S. 35° E.	5.725	0.118	Four rainy days. Thunderstorms on the 5th, 8th and 31st.
Range	0.334	16.4	30.2	...	...	...	...				
Aug. ... Max...	29.955 (27)	86.5 (1)	95.5 (26)	.0375 (1)	94 (29)	11 (17)	62.8 (17)				
Mean	..	81.2	...	.0316	85	7	15.5				
Min....	29.461 (18)	76.6 (18)	71.6 (19)	.0298 (17)	76 (12)	4 (11)	0.9 (5)	S. 60° E.	3.399	13.351	Fifteen rainy days. Thunderstorms on the 1st, 3rd, 4th, 5th, 6th, 25th and 29th. Typhoon on the 14th and 17th.
Range	0.494	9.9	23.9	...	...	...	...				
Sept. ... Max...	30.182 (30)	81.5 (2)	89.2 (2)	.0318 (2)	93 (15)	15 (5)	29.4 (23)				
Mean	29.922	71.8	...	.0211	79	9	10.2				
Min....	29.686 (6)	65.1 (25)	52.7 (25)	.0148 (24)	69 (24)	7 (2)	1.3 (26)	N. 15° E.	3.244	3.898	Six rainy days.
Range	0.496	16.4	36.5	...	...	...	...				

* Position of British Consulate-General, Shanghai :—Latitude, 31° 14′ 41″ N.; longitude, 121° 28′ 55″ E. of Greenwich.

NOTE.—The figures in parentheses indicate the days on which the observations to which they are appended were made. Under the headings "Diurnal Mean Temperature in Shade," "Humidity," and "Ozone" they indicate the days on which the *mean readings* were respectively highest and lowest.

The above abstract has been kindly drawn up by the Rev. Père DECHEVRENS, Director of the Sicawei Observatory.

The season was an average one as regards temperature and humidity, but the sun was unusually powerful in April, May and June, several cases of malaise from this cause having come under observation during these months. The end of June was wet and cool, but the weather became dry and heat intense early in July. From the 5th July to the 2nd August there was no rainfall, while the maximum temperature during the day oscillated between 90° and 95°, and reached 98° on the 31st July, when, after two stormy days, there was an interval of cooler weather, a cold breeze, which was not without danger, blowing every night during the early part of August. The entire month was stormy. September was cool and dry, a month so enjoyable that migration to Chefoo, however advisable for the sake of sea air and sea bathing, was, so far as comfort was concerned, by no means a change for the better.

BURIAL RETURN of FOREIGNERS for the Half-year ended 30th September 1886.*

CAUSE OF DEATH.	APRIL.	MAY.	JUNE.	JULY.	AUGUST.	SEPTEMBER.	TOTAL.
Variola	1†‡	*f* 1	...	...	...	...	2
Enteric fever	...	1§	...	1§	...	...	2
Continued fever	...	1	1§	...	...	...	2
General debility	...	...	...	...	1	...	1
Cholera	...	1§	...	...	2§	2 *f* 1 7§	13
Tuberculosis	*f* 1	*f* 1	...	...	...	...	2
Brain disease	1§	...	...	...	...	...	1
Chronic alcoholism	...	...	1†	...	*f* 1	...	2
Cerebral hæmorrhage	...	...	...	1	...	...	1
Apoplexy	...	...	...	...	*f* 1	...	1
Pulmonary congestion	...	...	*f* 1‖¶	...	...	...	1
„ embolism	..	...	*f* 1	...	...	...	1
Pneumonia	...	...	*f* 1	...	...	...	1
Chronic bronchitis	...	1‖	...	...	...	...	1
Heart disease	...	...	1	...	...	...	1
Fatty degeneration of heart	...	...	...	1§	1	...	2
Cardiac paralysis	...	...	...	...	1	...	1
Aneurism of innominate artery	...	...	1	...	...	...	1
Diarrhœa	...	1†	1§	...	...	...	2
Gastro-enteritis	...	...	...	...	...	2§	2
Dysentery	...	...	...	...	...	1 *f* 1 1§	3
Intestinal obstruction	...	...	...	...	...	1§	1
Rupture of intestine	...	...	...	...	...	1	1
Intestinal cancer	1	...	...	...	...	...	1
Bright's disease	...	...	1	1	...	...	2
Marasmus	...	...	1§¶	...	...	...	1
Premature birth	...	...	...	1¶ *f* 1¶	...	...	2
Tumour	...	1§	...	...	...	...	1
Suicide (gunshot wound)	1	...	...	...	...	...	1
Accident (fall from aloft)	...	1§	...	...	...	...	1
Burns	...	...	...	...	...	1§	1
Drowned	...	...	...	1†§	...	...	1
Found dead	...	1§	...	...	...	...	1
Buried on coroner's order	...	...	...	...	1§	...	1
TOTAL	5	10	10	7	8	18	58

* Not including deaths (if any) among the Catholic religious bodies, among Eurasians or Japanese; exclusive also of still-births.

† Macao parentage (4).

‡ Unvaccinated.

§ Non-resident (25).

‖ Native of Manila (2).

¶ Infant (4).

Subtracting 2 cases of premature birth, 1 case of suicide, 1 "found dead," 1 "buried under coroner's order" and 3 of accident, there remain 50 deaths to be attributed to disease. Deaths from disease among infants are represented by 3, two non-Europeans, and the third the child of a European visitor. The foreign adult mortality was therefore 47 (38 males and 9 females), against 38 (31 males and 7 females) during the corresponding period of 1885.

CAUSES of DEATH from DISEASE among RESIDENT EUROPEAN ADULTS.

Cancer	1	Cholera	3 (1 female).
Tuberculosis	2 (females).	Diseases of circulatory organs	5 (1 female).
General debility	1	„ of respiratory organs	1 (female).
Variola	1 (female).	„ of digestive organs	3 (1 female).
Continued fever	1	Cerebral diseases	3 (2 females).
Bright's disease	2		

14 males and 9 females, against 16 males and 6 females for the last previous corresponding period.

[No deaths among resident European children.]

CAUSES of DEATH from DISEASE among NON-RESIDENT EUROPEAN ADULTS.

Enteric fever	2	Diseases of digestive organs	5
Cholera	9	Cerebral disease	1
Disease of heart	1	Tumour	1

19 males, as against 9 males during the corresponding period of 1885.

CAUSE of DEATH from DISEASE of a CHILD of NON-RESIDENT EUROPEAN.

Marasmus 1

CAUSES of DEATH from DISEASE among RESIDENT NON-EUROPEAN ADULT FOREIGNERS.

Variola	1 (Macao).	Continued fever	1 (India).
Chronic alcoholism	1 („).	Cholera	1 (Chili).
„ bronchitis	1 (Manila).		

5 males, as against 4 males and 1 female in the last corresponding period.

CAUSES of DEATH from DISEASE among NON-EUROPEAN FOREIGN CHILDREN.

Diarrhœa	1 (Macao).	Pulmonary congestion	1 (Manila, female).

Dysentery, diarrhœa, the inflammatory diarrhœa of children, hepatic congestion, malarious and typhoid fevers, rheumatism and neuralgia, bronchitis and ophthalmia were the affections that made up the routine work of my own practice, and doubtless this list is a fairly representative one. Dysentery was unusually intractable, especially towards the close of the season, the small mortality registered during the half-year from this cause being deceptive. Year by year frank malarious fever becomes less common, its place being taken by typhoid; and it appears to me that the type of enteric fever grows more severe and the occurrence of hæmorrhage towards the close of the third week more frequent.

Last year I lost a case of typhoid from this cause. During the past half-year I have had three cases of late hæmorrhage, two exceedingly severe, but all terminating favourably. Bleeding ceased so soon after the administration of the liquid extract of hamamelis virginica in large doses, that I am inclined to attribute the fortunate event to this drug. In one of the three cases here referred to, myopia = 4 D appeared as a sequela in a patient whose refraction had previously been normal. In the remaining two cases obstinate periostitis of the tibiæ long retarded convalescence.

From April to June measles was prevalent, and whooping-cough became common in July. Several cases (mostly mild) of small-pox occurred in May and June. Many cases of varicella were under treatment in May; and parotitis, though I think not epidemic, was of frequent occurrence in June. During May a considerable number of cases of choleraic diarrhœa came under observation among the sailors, although judging by my own lists the Settlement was at that time tolerably free from diarrhœa in any form. Dr. SLOAN informs me that the cases he treated, although many of them sufficiently menacing, were not accompanied by cramp or suppression of urine. One case presenting all the symptoms of cholera occurred in my practice in May, and terminated fatally.

The patient, aged 42, was chief engineer of an ocean steamer lying at Woosung. On the evening of the 21st May he dined with a family in Shanghai. In the morning he and a gentleman who had also been of the party drank a pint of milk between them, and went together to Pootung. On the way he vomited several times, but insisted on starting for Woosung in a steam-launch. He went to bed immediately on getting on board his ship, and spent the evening and night purging and vomiting. At 10 A.M. on the 23rd the evacuations had ceased, but Dr. SLOAN found him with a temperature of 103°; skin cool; vertigo on rising; very drowsy and slightly delirious. He was treated on board that day. During the night purging and vomiting recommenced, the fluid discharged being "like milk and water." He had been sipping milk. He acknowledged that his urine was much diminished in quantity, but he thought he passed some with each stool. He was brought to the General Hospital at 4 P.M. on the 24th, and transferred to my charge at 5 P.M.

Meanwhile, on the afternoon of the 22nd the gentleman who had shared the milk with him began to complain of nausea, purging and abdominal pain. His temperature at 10 P.M. was 102°.5. Severe griping continued all night and through the next day. At 11 P.M. on the 23rd his symptoms had abated. Temperature, 98°.2. Great flatulent distension of stomach and intestines. Had had three stools, the first fluid, the others solid; all very fœtid. Had been treated with salicine in 30-grain doses, and laudanum to relieve griping.

Further, on the 23rd, three children who had dined with the family on the evening of the 21st, but who had drunk no unboiled milk, began to purge and vomit violently, with temperatures ranging up to 105°. These symptoms began to disappear towards night. One of the children had convulsive twitchings. With the exception of the patient, his friend, and these children, no one else who had shared the dinner of the 21st suffered in the least. As far as could be ascertained, all had eaten freely of everything served.

And lastly, at this same date several cases of "cholerine" occurred on board the ship to which the patient belonged, and on board another steamer also lying at Woosung. Both vessels were last from Hongkong. None of these cases proved fatal.

On admission to hospital, the history above detailed was given. During the afternoon patient's calf muscles had been severely cramped, and pulse was hardly, if at all, perceptible when he started from Woosung. Drank a bottle of champagne on the way, and immediately on arrival had a hypodermic injection of morphia which gave much relief.

Choleraic voice; eyes excavated; body covered with perspiration; vomiting and purging "rice-water;" temperature in mouth, 98°.4; tongue natural; breath cool, not cold; thirsty; pulse hardly perceptible, guessed at 110; slight dyspnœa. Quite collected.

He was ordered sinapisms; champagne; and 5 grains of salicine in milk every second hour. At 9.30 P.M. pulse could be counted at 96. One stool, fluid but yellow. No cramps. Had vomited once.

25th.—Two stools during night, chiefly milk curd; is certain that he passed urine with them (?). Occasional slight cramps in muscles of calves, front of thighs, loins, and radial side of forearms. Respiration sighing; dyspnœa on attempting to rise. Voice nearly natural. Hepatic dulness distinct to 1½ inch below ribs. The stools now became bilious and infrequent; the temperature fell in the afternoon to 96°.2, but

rose again to normal at night. Dyspnœa more marked. Skin drenched in cold sweat; voice flagging. Great restlessness.

On the 26th the stools were healthy, and having asked for some gruel he ate it with relish, and retained it. Vomiting arrested so long as he lies still. At 3 P.M. he passed about 2 oz. of urine, intensely acid and containing no albumen. Had one stool of typhoidal appearance. Pulse 132, hardly perceptible in right radial, imperceptible in left; temperature in mouth, 99°. Subsultus. Skin cold and wet. Respiration consists almost entirely in a regular series of deep sighs. During the night the surface temperature rose in consequence of assiduous rubbing.

27th.—Sleeping on back with eyes half open. Pulse, 90, strong, equal on both sides. One stool, typhoidal. No urine.

A drop of the stool examined under the microscope (× 200) showed a few granular red corpuscles; large epithelial scales, the largest deeply pigmented (yellow); a few fat globules; two normal blood corpuscles in three fields; minute fragments of muscular fibre (remains of food ?).

The tongue now became dry; temperature ranged between 96° and 97°.5. Drowsy but extremely restless. At 3.30 P.M. (27th) he insisted on getting into a long chair. Complains of loss of power in legs and arms, and of sensation of "pins and needles." Passed about ½ oz. of acid urine containing no more than a trace of albumen. Hiccough. At 9.30 P.M. there had been no stool; 4 oz. urine, which had been thrown away; one attack of bilious vomiting. Wanders when he falls into a doze. Had retained about 3 pints of milk.

28th.—After a restless night, with occasional sleeps, he suddenly lost the power of speech at 4 A.M. He remained conscious for about 20 minutes, and died at 5.15 A.M.

Postmortem, 6 Hours after Death.—Body that of a well-developed, muscular man, 5 feet 11 inches in height. Rigor mortis. Considerable amount of subcutaneous fat. Interior of body not markedly warm. Temperature of mortuary, 63° F.

Pericardium, covered with fat, contained about 1 oz. of yellow serum. No ecchymoses on visceral surface. Heart tightly distended, especially on right side. Both ventricles contained a quantity of loosely coagulated blood, and, in addition, moulds of completely decolorised fibrin of leather-like consistence intricately engaged among the columnæ and chordæ. One of these coagula was prolonged to a distance of 2½ inches up the aorta, occupying about one-third of its calibre. All the valves were competent and healthy. Heart drained weighed 13½ oz. Its surface was covered with fat. The pleuræ were not ecchymosed. Lungs crepitant throughout. Blood dripped freely from each lower lobe on section.

Stomach distended with gas, covering anterior surface of liver as far as mammillary line. Liver healthy but gorged, weighing 69 oz. after a great deal of blood had escaped from it. Spleen engorged, but not enormously. Kidneys:—right weighed 8 oz.; left, 7½ oz.; easily decorticated. Blood flowed freely from them on section. Tissue very friable from distension. No disease. The ileum for about 18 inches from the ileo-cæcal valve was injected, the injection in two places close to the valve being visible through the peritoneal coat. No ulceration of PEYER'S patches, but deep congestion and infiltration. This was rendered more manifest by thinning of the intestinal wall between the patches, the mucous surface in these situations being denuded of epithelium. The same appearances were observed in the cæcum, and for about 3 inches of ascending colon. Transverse colon distended with gas. Ileum contained a small quantity of typhoidal fæces. Bladder contained about 6 oz. of urine, depositing merely a cloud of albumen on boiling.

I certified the death as due to cholera; but the diagnosis is at best doubtful. With this full history each reader can judge for himself as to the part possibly played by something eaten at the dinner party or by the milk swallowed on the following morning.

No cholera was observed, so far as I know, between June and the 26th August. After this latter date several cases occurred, mostly among the shipping.

APPENDIX.

PLATES ILLUSTRATIVE OF DISEASE ENCOUNTERED AMONG CHINESE RECEIVED INTO FOREIGN HOSPITALS IN SHANGHAI.

(Continued from Vol. xxxi.)

(These Woodcuts are traced from Photographs.)

PLATE VII.—*Result, 6 weeks after excision of 7th and 8th Ribs, and removal of much carious Bone from bodies of 8th and 9th dorsal Vertebræ.*

Patient had fallen from a scaffolding three months before admission, striking left chest against a beam. Had been laid up ever since. Wasted to a skeleton. More than 20 oz. of pus expectorated daily. Large fluctuating tumour containing air occupying lower lateral region of left chest. Horseshoe incision with convexity downwards from axillary line to middle of back. Large cavity opened lined with false membrane, its walls formed of tissues so matted together as to be indistinguishable from one another. This cavity contained a large quantity of areolar sloughs. The 7th and 8th ribs were found partly carious and partly necrosed; and were removed. The bodies of the 8th and 9th dorsal vertebræ were deeply carious and were gouged. Patient was thought to have died on the table, and had a severe struggle for life during some weeks. Discharged cured on the 70th day after operation, the wound having been dressed for the last time on the 45th day. [St. Luke's Hospital. Dr. JAMIESON.]

PLATE VIII.—*Periosteal Fibro-sarcoma of Lower Jaw, left side, extending nearly to clavicle, and widely displacing all the surrounding soft parts.*

Considerable number of large but unrecognisable vessels divided between ligatures before mass could be removed. Rigorous antiseptic treatment. Wound completely healed on 11th day. [St. Luke's Hospital. Dr. BOONE.]

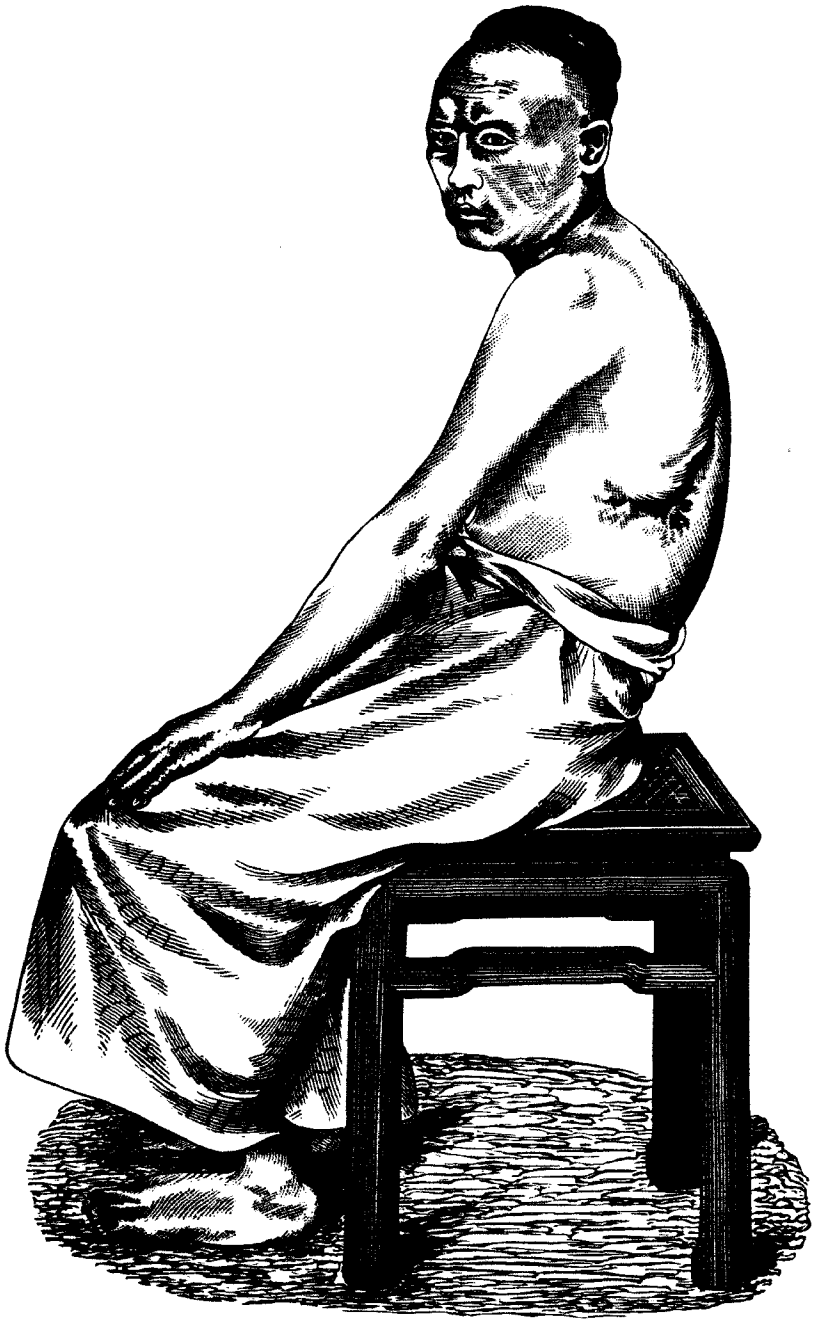


PLATE VII.

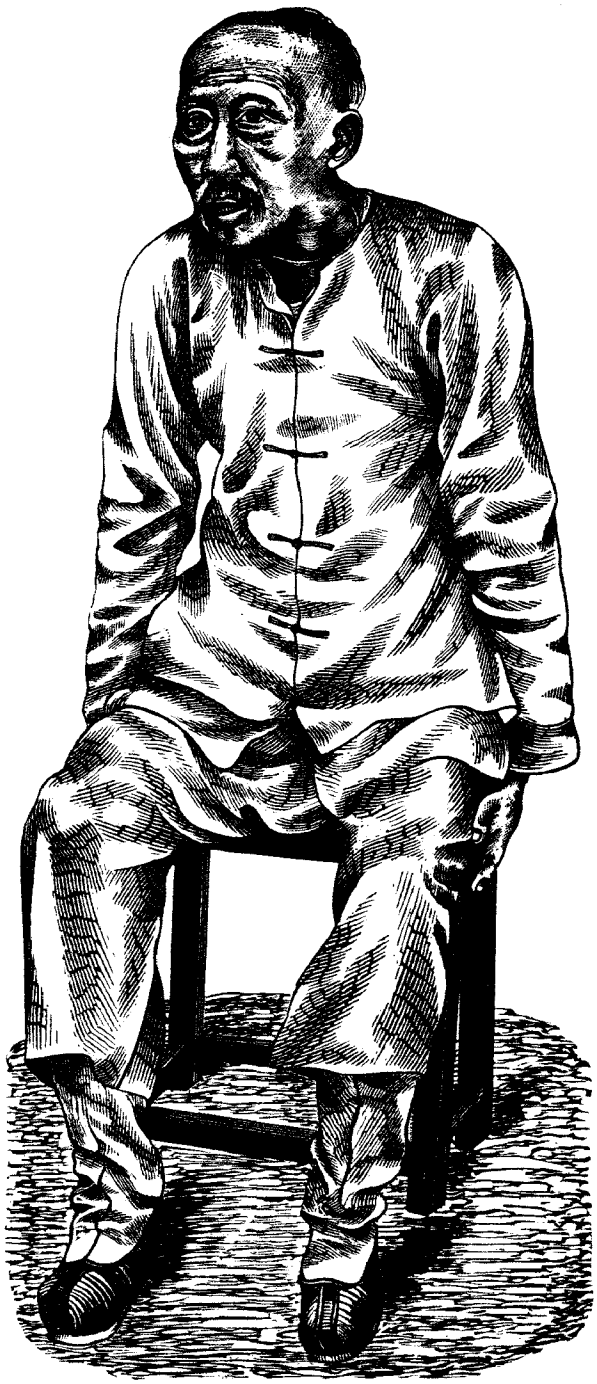


PLATE VIII.

II.—SPECIAL SERIES.

No. 1.—Native Opium	Published	1864.
„ **2.**—Medical Reports: 32nd Issue (First Issue, 1871)	„	1886.
„ **3.**—Silk	„	1881.
„ **4.**—Opium	„	1881.
„ **5.**—Notices to Mariners: Fourth Issue (First Issue, 1883)	„	1886.
„ **6.**—Chinese Music	„	1884.