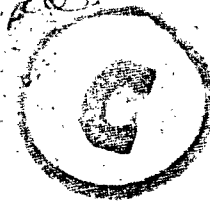


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Sanitary Commission. (*Medical Times and Gazette*,
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Abstract of the Proceedings and Reports of the Inter-
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Bombay Presidency, 1867....

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fecal solids, fluids and gases by pneumatic forces
combined with an improved method of sewage utilisation.
Compiled for the information of Sanitary and Municipal
authorities, and all interested in agricultural develop-
ment. By Frederic Charles Krepp, Author of Statistical
Book-keeping, Member of the Royal Institute of Engineers
of the Netherlands and of Maatschappij van Nyverheid :
Life Member of the Freien Deutschen Hochstift and of
the Senken bergischen Naturforschenden Gesellschaft
at Frankfort on the Maine ; etc. London ; Longman,
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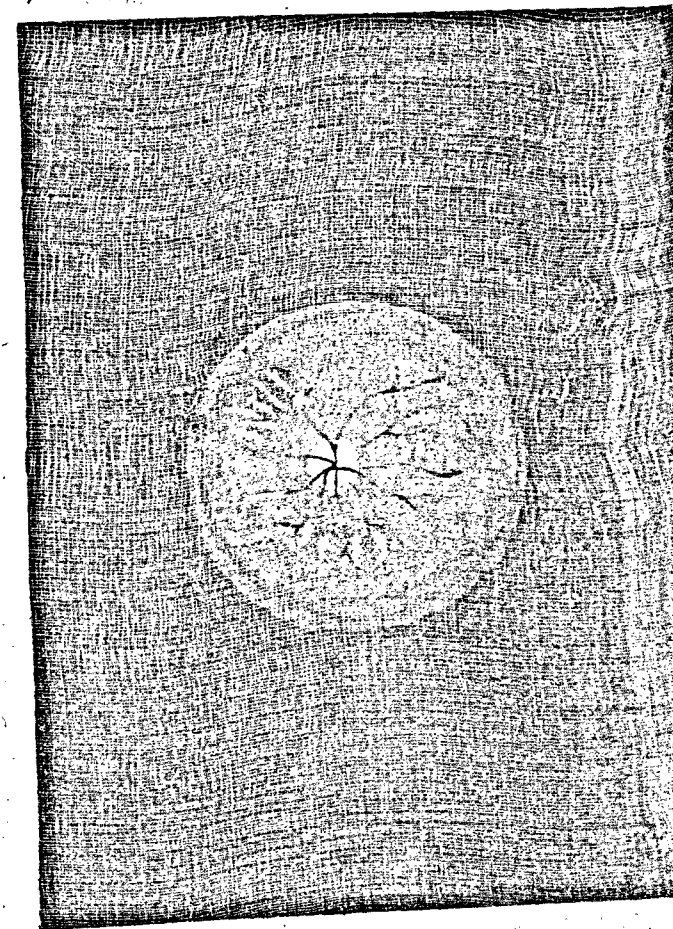
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THE FUNDUS OCULI OF CASE N° 2.
(INDIRECT EXAMINATION.)

1. The temporal side of the disc.
2. The nasal side of the disc.

*In the Madras Quarterly Journal N° 15 page 74 is given a chromo-
ultragraph of the healthy fundus oculi with which the present
illustration may be advantageously compared.*

3

THE MADRAS QUARTERLY JOURNAL OF MEDICAL SCIENCE.

No. XXIII & XXIV.—DECEMBER, 1867.

PART I. ORIGINAL ESSAYS.

ART. I.—*A Clinical Lecture on Syphilitic Retinitis.* By
GEORGE SMITH, M.D., Superintendent of the Eye Infir-
mary.

IN this lecture I propose to bring to your notice certain
points of interest connected with that rare but interesting
disease Syphilitic Retinitis.

I place before you three (1) original ophthalmoscopic draw-
ings of cases which have come under my care, and I also
shew you three illustrations of the same disease from Lieb-
reich's beautiful "Atlas der Ophthalmoscopie." (2) A care-
ful study of these drawings may help to impress on your
minds some of the more prominent features of this remark-
able affection.

Syphilis is a very common disease among the natives
of India. Those who are conversant with the maladies of
the poorer classes know that a considerable proportion of
the patients who attend our Hospitals and Dispensaries are

(1) The second of these three drawings is reproduced in chromo-lithography
here.

(2) Tab. iv. fig. 2, and tab. x. figs. 1 and 2.

சுருத்திபதி உரை

செப்பணிபுறப் பெயர்

செப்பணிபுறத்தாக எடுத்த
கொள்ளப்பட்ட நாள்

செப்பணிபுற முடிந்த நாள்

சரிபார்க்கும் ஆராய்ச்சி
மு. பா. எ. உதவியாளர்
கையொப்பம் கையொப்பம்

the subjects of syphilis, (1) either in its acquired, or hereditary form. Many of the diseases of infancy and childhood which occur in the native community, have a specific origin; much of what we rather indiscriminately call struma, proceeds from the same source; and, probably, not a few of the fatty and amyloid degenerations of tissue of advancing life might be traced, were care taken in conducting the inquiry, to Syphilitic Cachexias, either inherited or acquired.

Ricord, indeed, has asked the question, "Is not all struma of syphilitic origin?" To this startling query, many besides yourselves would probably reply, "Certainly not; why ask so foolish a question?" But men like Ricord are not in the habit of asking foolish questions, and it behoves us to ponder well any suggestion emanating from such a source. My own opinion is, that the more we reflect upon the question, and the more carefully we seek an answer from experience, the more shall we be convinced that no inconsiderable proportion of cases of so-called struma arise directly or indirectly from constitutional syphilis. (2)

There is no disease which more demands our careful study than syphilis. There is no disease of the specific-contagious group whose phenomena are so remarkable, so varied, so persistent, so prone to recur, and so apt to mislead. He

(1) Syphilis is a less severe disease in tropical than in temperate climates. Does the prevalence of hereditary syphilis among the lower classes of native patients in Madras modify the constitutional and local symptoms of the acquired disease?

(2) See a contribution by F. Jordan, F.R.C.S., on "Hereditary Syphilis in relation to so called strumous Diseases, and in relation to acquired Syphilis." Mr. Jordan remarks, "Among the diseases which observation leads me to regard as essentially syphilitic, are caries—of any bone and at any age,—and, of course the results of caries, angular curvature, psoas and lumbar abscesses and others; phthisis in any form or at any age; tubercular disease everywhere,—lungs, brain, glands, mesenteric or other—chronic hydrocephalus, fistula in ano with or without phthisis, enlarged glands, eczema, strumous ophthalmia, ophthalmia tarsi, and the great majority of ulcers on the leg or elsewhere. Rickets and spinal curvatures generally, are probably due to inherited syphilis. Among diseases not usually regarded as strumous, which I have constantly found associated with hereditary syphilis, is the choroido scleritis so often present in myopia." * * * "The diseases to which I now more particularly draw attention as syphilitic diseases are caries and phthisis—diseases which may be considered the most important and the most representative of so-called strumous disease."—*Medical Times and Gazette*, June 22nd, 1867, page 697.

The remark in the text was made before Mr. F. Jordan's paper came to hand. The subject is a deeply important one.

who understands syphilis aright has mastered a large and important page of pathological science.

You are aware that the organ of vision is frequently the site of local manifestations of syphilitic disease; interstitial keratitis, kerato-iritis, iritis, irido-capsulitis, cyclitis, chorooiditis, retinitis, and affections of the vitreous humour may all be induced by the specific dyscrasia.

My present object, however, is to confine your attention to a few clinical cases, in which the brunt of the ocular disease was borne by the Retina and Choroid. The cases are in abstract, and the ophthalmoscopic examination is appended to each. All unimportant matter has been purposely excluded.

CASE 1.—V. S., a Brahmin, *Æt.* 34. Four years previous to his coming under my care, (October 1863) he had suffered from primary syphilis, followed shortly by secondary eruptions. Some months after the appearance of the secondary symptoms he was attacked with paroxysms of severe pain in the temporal and frontal regions. These paroxysms recurred nightly for twelve nights. During this attack he observed muscæ volitantes, and his vision became much impaired. He was placed under mercurial action and the eruption subsided, vision at the same time becoming improved. Subsequently, the eruption and impairment of vision re-appeared, to subside a second time under mercurial treatment. For two years vision continued good. Recently the sight of both eyes has become gradually and seriously impaired.

Ophthalmoscopic examination, (1) 6th October 1863.

Right eye.—Optic disc small, circular, with periphery of a purplish colour; (2) arteries and veins small. Retina seen somewhat indistinctly owing to partial haziness of the vitreous humour. Slight opacity of the Retina in the course of the larger vessels. Inconsiderable disturbance of the pigment cells, revealing here and there some of the larger and more superficial vessels of the choroid. A corona of uveal spots is seen on the anterior capsule of the lens.

(1) All the ophthalmoscopic examinations alluded to in this lecture were made by the indirect method.

(2) The researches of Dr. Galezowski of Paris shew that the blood which nourishes the optic papilla is not derived from the retinal artery, but from peri-neural branches of the vascular system of the meninges.

Left eye.—Pathologically affected as the right eye, though to a less degree.

Let me indicate the principal clinical points in this case, in so far as we have it before us. You will observe that the implication of the ocular structures was synchronous with the appearance of the secondary symptoms, and that it occurred within two years of the date of the primary infection. This latter fact is in accordance with a wide range of experience, and Mr. Hutchinson has embodied it in his sixty-sixth aphorism—"If a person who has suffered from acquired constitutional syphilis have passed two years from the commencement of this disease, and have had no inflammation of any tissue of the eyes, he may be tolerably sure that these organs will not suffer in the future. Relapses of inflammation after previous iritis, choroiditis, &c., are common even after very long periods, but it is exceptional for any one of these to originate after the interval mentioned." A second point in the case to be observed is the group of symptoms with which the ocular affection set in. These symptoms point plainly to irido-choroiditis with implication of the vitreous humour, and the proof is derived from the severity and character of the pain, from the permanent corona of uveal spots on the lens, and from the presence of muscæ volitantes with correspondingly impaired vision. A third point to be noted is the marked power which mercury exerts over the local manifestations of syphilis, whilst it manifestly fails to cure the dyscrasia.⁽¹⁾ This is a practical fact of great importance, and accounts equally for the ameliorations and for the relapses indicated in the case under remark. Finally, you will observe the symmetry of the disease, although, as in the case of all symmetrical diseases, the local manifestations are neither strictly synchronous nor of equal severity.

The ocular disease had been in existence about two years when the first ophthalmoscopic examination was made, and this examination reveals a serious amount of retinal implication. With the exception of the initial symptoms, the affection appears to have progressed almost painlessly, with the result of inducing considerable atrophy of the optic nerve and of the retinal vessels, slight opacity of the retinal tissue and of the vitreous humour, and inconsidera-

(1) Are we quite sure that it fails to cure the dyscrasia in cases of *infantile syphilis*?

Le mercure fait disparaître les manifestations actuelles; il ne neutralise pas la diathèse.—"Ricord."

ble disturbance of the pigment cells; the retinal implication being greater than the choroidal. Pure syphilitic retinitis is nearly painless; for the most part it progresses slowly, and its principal symptom is gradually increasing impairment of vision. Pain, in cases of syphilitic retinitis, affords a practical standard by which to judge of the probable extent and severity of irido-choroidal complications.

Details of case continued:—

19th November 1863.—An examination made on this date reveals the presence in the retina of a cluster of opaque specks of exudation on the temporal side of the optic disc. These specks are circular, well defined, about twenty in number, and present a dull grayish white colour. They lie in a plane below that of the retinal vessels, and apparently in the deeper layers of the retina rather than on the surface of the choroid. In the left eye some dark films traverse the vitreous humour, and a few pigment patches are observed in the retina.⁽¹⁾

24th December 1864.—A third examination after a year's interval reveals the following condition of the fundus oculi:—

Right eye.—Opacities in the vitreous. Optic disc circular, small, anæmic; vessels small; retina generally transparent and anæmic; gray specks of exudation present, but less distinctly defined. Pigment stippling of the retina towards the ora serrata.

Left eye.—Vitreous humour clear; retinal exudates have disappeared. Pigment stippling as in the right eye. Atrophy of the pigment layer has not increased.

Eighteen months after this exploration, a final examination of the eyes was made with the following result:—

31st July 1866.—*Right eye.* Optic disc circular, small, pink, cupped; vessels very small. On the temporal side of the optic disc there is seen a large, oval, gray patch of exudation in the retina, with two smaller patches above it. The pigment of the pigment layer has entirely disappeared, the large vessels of the choroid being distinctly seen. The

(1). The development of pigment in various tissues in connection with the syphilitic dyscrasia is a remarkable pathological fact, deserving of careful investigation.

pigment deposits in the retina and vitreous have increased. Transparency of the vitreous in the axis of the eye somewhat dulled. *Left eye*.—Optic disc circular, small, pink; surface of disc hazy from exudation; vessels atrophied; retina generally opaque and of a grayish white colour. Vision much impaired.

The changes in the deep structures of the eyes, which took place during a period of nearly three years, are now before you. The optic disc retaining its circular form has become atrophied and cupped; the retinal circulation has failed, and the retina itself has become more or less opaque. The exudation into the retinal layers, which at first affected the course of the larger vessels, assumed subsequently the appearance of specks, then of widespread patches, and finally of general infiltration. The pigment layer, which at first was but slightly affected, a few of the cells only being disturbed, finally exhibited extensive atrophy of the cells with pigment infiltration of the retina; and lastly, the vitreous humour, at first merely hazy from exudation from the ciliary processes, presented latterly opaque films and pigment deposits. The serious character of the ultimate degeneration of tissue the result of syphilitic disease of the deeper structures of the eye, is well illustrated in the case I have now placed before you.

CASE 2.—F, a native male patient, *Æt.* 25. The patient states that six years ago he suffered from primary syphilis, followed by syphilitic rheumatism, but not by secondary cutaneous symptoms. He has, however, but an imperfect remembrance of the symptoms which followed the primary infection. About two months ago he was attacked with severe frontal, temporal, and general cephalalgia. His general health is indifferent; within the last month vision has become much impaired.

Ophthalmoscopic examination (indirect).—Optic disc circular, pink, and atrophied; free from œdema or exudation; retina anæmic, somewhat opaque and studded with exudation. Retinal vessels small and few in number; some of these vessels dip out of sight in the infiltrated retinal tissue; two retinal veins present distinct varices, and the calibres of the veins diminish as they approach the optic disc. The retina exhibits a chalky-white reflection. On the temporal side of the optic disc lies a group of eight small, circular exudations of a grayish white colour. These exudates, as

well as others which are visible, affect the course of the retinal vessels. On the nasal side of the optic disc, as well as inferiorly, similar deposits are seen passing into general infiltration of the retinal tissue. Cells of the pigment layer are unaffected.

In this case of syphilitic retinitis there are several points of interest. At first sight it would appear as if it traversed the law laid down in the form of an aphorism by Hutchinson, to the effect that syphilitic disease of the eye never commences, as a general rule, beyond two years from the date of the primary infection. Had this statement been advanced by case No. 1, an educated and very intelligent Brahmin, I should have accepted it as true, but being made by an uneducated and unintelligent native, little if any reliance is to be placed upon it; not that natives of the lower classes intend to mislead on such points, but because, as a general rule, facts connected with attacks of disease, with the sequence of symptoms, and with the lapse of time leave on their memories little if any permanent or accurate impression. Moreover, the pathological appearances of the fundus oculi are those not of recent but of chronic action, proving that the disease must have been in progress for some considerable time.

The pathological appearances resemble closely those indicated in the former case, with the exception that the cupping of the optic disc, the pigment infiltration of the retina, and the extensive atrophy of the pigment layer there recorded are not observed in the case under remark; and, in passing, I may be allowed to direct your attention to the great distinctness with which pathological changes, involving alterations in the transparency of the retina, are seen in the eye of the native of India, owing to the deep layer of pigment which lies behind the transparent retina. In consequence of this dark backing, the slightest changes in the transparency of the retina are early detected, and the exact position of the exudation may generally be made out with accuracy, by noticing, on the one hand, the behaviour of the retinal vessels, and, on the other, the presence or absence of disturbance of the cells of the pigment layer.

CASE 3.—K. R., a native male patient, *Æt.* 38. This patient's medical history is that of syphilis of five years' duration. The primary symptoms were followed by sore throat, rheumatism, and secondary eruptions. Within two years of

the date of the primary infection he was attacked with iritis, and vision was nearly lost. Under mercurial action his sight was restored; subsequently he suffered from constant headaches, and his sight has become gradually impaired. With the left eye he can distinguish day from night; with the right he has useful, though imperfect, vision.

Ophthalmoscopic examination.—Optic disc small, circular, anæmic and covered with a chalky-looking deposit; vessels atrophied and reduced to mere threads; retina anæmic, opaque, and presenting an uniform chalky reflection. On the temporal side of the optic disc and spreading thence in the direction of the macula lutea, is seen an extensive dense infiltration of a grayish white deposit. This infiltration shows, here and there, that it had been deposited originally in the form of separate nodules. On the nasal side of the optic disc towards the periphery of the retina pigment patches are to be seen. The state of the choroid cannot be ascertained. The vitreous humour is slightly hazy.

The symptoms in this case point to early implication of the iris, and to choroidal affection concurrent with the retinal degeneration. In this instance the infiltration has proceeded to a great length, probably to that of fatty degeneration, involving the almost total anæsthesia of the retina.

In none of the cases which I have now placed before you have the earlier stages of the disease been represented. I regret that I cannot, from my own case-book, supply this deficiency, but I have endeavoured to supply it from the best contemporary medical literature at my command, and in Liebreich's "*Atlas der Ophthalmoscopie*," I have found the required illustrations. Tab. x. fig. 1, exhibits a case in which the retinal complication set in exceptionally early after the primary affection. The patient, *Æt.* 24, had been treated for indurated chancre from the beginning of December 1860 to the middle of January 1861. About the end of January 1861 he suffered from inflammation of the right eye, accompanied with violent pain, redness and impaired vision. Mercury mitigated these local symptoms. Soon after, the sight of the left eye became affected, though without antecedent inflammatory symptoms. At the close of February, secondary eruptions appeared, which left copper-colored blotches. Dr. Liebreich saw the patient about the end of April, five months from the commencement of the disease and three from the implication of the structures of

the eye. The coloured illustration represents the fundus of the left eye in which the morbid changes proceeded painlessly, thereby indicating that the retina itself was principally affected.

I shall now describe shortly these morbid appearances, and would ask your careful attention to them, as they throw light upon important pathological questions.

Implication of the choroid is shewn by the presence of hæmorrhagic ecchymoses in the neighbourhood of the optic disc, and more particularly between the disc and macula lutea. Along with these effusions, patches of opaque yellowish lymph are seen between the choroid and retina, around the margins of which are grouped dislocated cells of the pigment layer, a condition involving the destruction of the elastic lamina, which intervenes between the chorio-capillaris and the pigment layer of cells.⁽¹⁾ More striking morbid phenomena, however, are exhibited by the retina and optic nerve. The superior branch of the retinal artery which sweeps round the macula lutea is small in calibre, but distinctly seen. No haziness of the retinal tissue is observed in connection with this vessel, or with any of its branches. The corresponding vein, however, is enlarged and tortuous, from pressure on its walls at the point where it dips into the optic disc. In the track of this vein and of one of its larger branches a distinct and well-defined haziness is seen, stretching like a delicate nebula along both sides of the vessel. At one point the exudation is more dense, white and circumscribed, and at that point the venous ramuscle is diminished to one-half of its size, as if from morbid constriction of its tube, or from the direct pressure of the external exudation. Before proceeding further let me solicit your attention to the behaviour of the artery and corresponding vein, as indicating pressure upon both in the track of the optic nerve. Syphilitic neuritis with exudation had preceded the implication of the retina. The result of the pressure upon the artery was to diminish somewhat its size; upon the vein to increase materially its calibre, and to make the vein itself tortuous and varicose. The effect of this mechanical obstruction to the circulation was to determine exudation from the vein, before any pathological change in connection with the artery had taken place.

(1) This pigment layer belongs, according to Schultze, rather to the retina than to the choroid, from which it is separated by an elastic lamina.

A second point to be noted is the constricting power of the specific exudation, when that exudation takes place in notable quantity. I shall have to revert to this peculiarity by and bye. But to continue:—the lower branch of the retinal artery, close to the disc, cannot be seen, neither can its corresponding vein, both having become entirely obliterated by an opaque exudation of specific lymph, which exudation follows principally the course of the veins, obliterating them, and converting them and the arteries into delicate white threads. The same exudation covers also a portion of the optic disc, and the impression conveyed to the eye, is, as if the disc itself had been the starting point from which the exudation had passed into the retina.

In figure 2 a still earlier phase of the pathological process is visible. A nebula of exudation conceals the optic disc and spreads into the adjacent retina, principally in the direction of the macula lutea.

From all we have now learnt, it is probable that in syphilitic retinitis with moderate implication of the choroid, or in those rare cases of uncomplicated syphilitic retinitis the sequence of pathological changes may be as follows:—1, Syphilitic neuritis with effusion into the textures of the optic nerve; 2, Obstruction to the retinal circulation as exhibited by diminution in the size of the arteries, and by increase of the calibre of the veins; 3, Nebular exudation in the track of the vein; 4, Deposits of cell exudates (exhibiting a tendency to fibrillation and to contraction) first, in the form of nodular deposits, subsequently, in that of more or less general infiltration with exclusion of the blood vessels; 5, Ultimate degeneration with anæmia and pigment infiltration of the retinal tissue, entire obliteration of the blood-vessels, with atrophy and cupping of the optic nerve. The exudation appears to pass through three well-defined stages—first, that of an inflammatory exudation, not probably to be distinguished from that of simple inflammatory action; second, that of an opaque nodular fibro-plastic contractile effusion; and thirdly, that of an infiltration, assuming ultimately all the essential features of lardaceous degeneration.

According to English ophthalmic surgeons, it is but seldom that syphilitic disease is confined to the retina, though the extent to which the choroid may be implicated must vary in each individual case. I have chiefly dwelt upon those instances of the disease in which the brunt of the morbid action

fell upon the retina, but my lecture would hardly be complete were I to omit all notice of those varieties of the disease in which the choroidal implication is prominently marked. Mr. Hutchinson in his admirable "*Clinical Memoir on certain Diseases of the Eye and Ear, consequent on inherited Syphilis*" (page 137), gives a detailed account of the microscopic examination of the affected tissues, in a case of hereditary syphilitic disease, in which the choroid was primarily and principally affected. I shall quote the passage for your information.

(a) *The choroid and hexagonal cells.* "The stellate pigment of the choroid and the larger choroidal vessels offered no peculiarities. Numerous clusters of cells were deposited round the capillaries, and round those of the larger choroidal vessels which are near the elastic lamina: these clusters had a roundish shape. The cells were of a crown-glass colour and strongly translucent, being in size somewhat larger than corpuscles. Some of the blood vessels were entirely surrounded by cells, others only on the side nearest the elastic lamina. The latter had, in many places, disappeared, and the cells had passed through the gaps and occupied the place of the adjoining rods; these latter were in other places distorted, bent, &c., by similar clusters of cells. In no instance had these cells passed beyond that part of the retinal frame-work. The cells were in immediate apposition with each other, and separated from the surrounding parts by a thin layer of obscurely fibrillated tissue; the fibrillæ were lost sight of in the surrounding pigment of the choroid; in the retina they mingled with the rods. The margins of the apertures in the elastic lamina of the choroid were thickened by a tissue similar in appearance and transparency to that of the lamina. The hexagonal cells appeared normal, except those over portions of the choroid which were occupied by clustered cells, and those which immediately surrounded the apertures in the elastic lamina. The former had lost their hexagonal shape; they were rounded off, and their pigment granules, instead of being of a pale brown colour, as the remainder, appeared, some deep brown, others black; which seen with the naked eye, gave the choroid the appearance of being sprinkled with black dots. The latter were heaped up round the apertures in the elastic lamina; they were round, and their pigment granules were black; at many places these cells had been displaced among the rods. The clusters of cells were most numerous in the

portion of choroid at the equator of the eye; the choroid round the optic nerve and yellow-spot appeared healthy.

The Retina.—The frame work of the Retina, the rods excepted, appeared not changed; the latter were, as above mentioned, displaced, distorted, &c. by the morbid products emanating from the choroid. Many of the loculi formed by what are called the radial fibres, were empty, others were occupied by healthy-looking cells, others filled with what appeared to be oil globules. The grayish, white, and yellowish opaque dots, seen in the retina with the naked eye, were due to these accumulations of oil (?) globules in the loculi of the retinal frame-work. The place of the delicate cell layer, immediately beneath the optic nerve fibres, was occupied by an amorphous molecular grayish deposit. The walls of the retinal blood-vessels were thickened. The layer of true optic nerve fibres which overlies the retina appeared healthy.

In the example now given, the disease consisted primarily of an inflammatory affection of the chorio-capillaris, in which we recognize the exudation of clusters of cells. These neoplasms had broken through the elastic lamina, disturbing the cell layer, liberating the pigment granules, and intruding upon the bacillary structure of the retina. Surrounding these cells was observed obscurely fibrillated tissue. The process of pigment infiltration of the retina is also indicated in this case as the result of morbid pigment products emanating from the choroid. From morbid changes, such as those described here in connection with the choroid, and from those which we have indicated as occurring in the retina in consequence of syphilitic inflammation, you can readily understand how frequent must be the occurrence of partial or general hæmorrhagic effusions, either from the vessels of the chorio-capillaris, or from the veins of the retina, causing, in the former, more or less complete separation of the retina from the choroid, and, in the latter, effusion of blood into the retinal structure, between the retina and hyaloid, or into the vitreous humour itself. This proneness to hæmorrhagic effusion should not be overlooked.

I have thus endeavoured to place before you the more prominent facts connected with this interesting subject, these facts having been culled from one case of recent *acquired* disease, from three cases of chronic *acquired* disease, and from one of chronic *inherited* dyscrasia.

On comparing the details now given with those of syphilitic action in other organs, you will remark not a few points of general resemblance. Syphilitic inflammation seems to affect primarily the smaller vessels, and, after various stages of morbid action, to issue ultimately in degeneration of a lardaceous type. The cell exudates exhibit a tendency to fibrillation and contraction in the earlier stages of the specific affection, and it is this tendency to contraction of tissue and to morbid exclusion of the blood-vessels, which leads to the ultimate atrophy and degeneration of the implicated tissue. Similar morbid changes have been traced by pathologists in the syphilitic liver, brain, spinal cord, lungs, testis, spleen, kidneys, ovaries, muscles, heart, skin, ligaments, mucous membranes, bone, cartilage, placenta, &c. Let me instance briefly the syphilitic liver. I quote from Dr. Wilk's Lectures (Part 3—*Lancet*, February 9th, 1867.) "There are three varieties of the Syphilitic liver; the first that in which the whole organ has become infiltrated by a new fibre tissue, producing a uniform and general hardening; the second in which the presence of the new material in the course of the portal vessels has produced a contraction like that of cirrhosis; and the third and most striking form, where the organ is pervaded by distinct nodules of the new formation."

The question may be asked, can we always with certainty distinguish syphilitic from simple retinitis? In reply, I would say that in their early stages the two diseases cannot be accurately differentiated. There is the same capillary congestion of the nerve; the same impairment of the transparency of the retina; the same swollen, tortuous and, at times, interrupted appearance of the veins; the same tendency possibly to capillary hæmorrhages into the retinal tissue. But in the more advanced stages, the diagnosis becomes comparatively easy. In simple retinitis the exudation is scanty compared with the vascularity, whereas in syphilitic retinitis the very reverse holds good, the vascularity being slight and the exudation abundant. In simple retinitis the vascularity increases as the disease progresses; in the syphilitic form the vessels atrophy as the disease advances; in simple retinitis the exudation disappears with the subsidence of the disease; in syphilitic retinitis the exudation may become absorbed, but it is prone to recur, and has a greater tendency to become permanent, and to pass through the stages we have already indicated.

Finally, the absence of a syphilitic history in one case, and its presence in the other, greatly assists the diagnosis, which may be still further verified by noting the remedial effects of mercurial action.

In connection with our subject, I have pointed out to you the pathological changes which frequently take place in the vitreous humour, and I would now add, what a recent case of syphilitic retinitis has brought prominently to my own notice, the tendency exhibited by the crystalline lens to become opaque, in consequence of the deranged circulation and nutrition of the choroid. These secondary cataracts form at times rapidly, within a year or so of the first attack of syphilitic iritis; at other times the trophic changes take place in the lens more slowly, especially in those cases where the retina is solely or principally affected.⁽¹⁾

I have spoken of syphilitic retinitis, or rather, as it should be called, syphilitic choroido-retinitis as a rare disease, but the possibility of its occurrence should always be borne in mind when we have to deal with cases of specific iritis, more especially when the disease becomes chronic with implication of the choroid and of the vitreous humour, as indicated by severe pain, *muscae volitantes*, and by gradually impairing vision. You will not, however, place much confidence in the mere absence of pain, because you know that if the retina alone be affected, you will have phenomena of special sensation present, in lieu of pain, which is the equivalent expression of structures possessing common sensibility. On this point I may quote Dr. Galezowski's opinion that true syphilitic retinitis begins painlessly with gradually impairing vision; that photophobia, photopsia and chrupsia are common symptoms, and that *colour blindness* almost differentiates a true retinitis from any variety of the disease in which the choroid is principally implicated.⁽²⁾

(1). The lens in its embryonic development is connected solely with the cutis, and specially with that portion of it called the corneal lamina, the cells of which it is composed being true epithelial cells. The vascular supply of the lens, however, is derived from the nervous layer, which, in addition to the retina, provides also the choroid, ciliary processes and iris. This may enable us to understand how the lens may suffer alike from the superficial and from the deep-seated disorder and diseases of the organ of vision, and how its integrity may be influenced by affections of the skin and of the mucous membrane.

(2) "Mais un des phénomènes les plus curieux et le plus importants pour le diagnostic de la rétinite ou de la névrite syphilitiques, c'est la cécité partielle

The *Treatment* of syphilitic retinitis may be laid down in one sentence:—rational mercurialism followed by eliminants, and by blood and nervine tonics. Mercury, judiciously given, that is, short of the point of salivation, is, in my opinion, the only trustworthy remedy in such cases. Under its operation the specific exudation, if recent, disappears, the tendency to the deposit of more is arrested, at least for the time, and vision is often completely restored. The constitutional dyscrasia is not cured,⁽¹⁾ nay, possibly, it may even be increased by the addition of another poison to the blood, but the local manifestations of the disease are relieved for the time, and, for the time at least, vision is saved. In prescribing your mercurial, remember the injury to the blood which attends the constitutional effect of the remedy, and support your patient with good food, and, if necessary, with stimulants, so as to secure the local effect of the remedy at least expense to the constitution, and, having gained your object, follow up the treatment with blood and nervine tonics. French practitioners are fond of the Iodides and Binioides of Mercury; others prefer mercurial inunctions and fumigations; others adhere to calomel and opium; some give blue or Plummer's pill. It matters little which you use. I generally employ the Hydrargyrum cum creta in combination with quinine and opium, adding a little calomel should the combination prove too feeble, and recommending mercurial inunction to the temples.

Except in the very earliest stage of the disease depletion in any form is unwarrantable. Desmarres recommends the application of cupping glasses or of artificial leeches of the temples, and Galezowski speaks highly of the power exerted by digitalis in abating the violence of deep-seated conges-

des couleurs, que nous avons toujours observée chez ces malades. Ainsi lorsqu'il s'agit des couleurs composées comme le vert ou le violet, les malades ne perçoivent qu'une des couleurs primitives qui les composent : le vert leur paraît jaune et le violet rouge; parmi les couleurs principales, il arrive fréquemment qu'ils ne distinguent pas la couleur bleue. Pour reconnaître ce phénomène je me sers de l'échelle chromatique, que je fait arranger à cet effet : toutes les couleurs sont représentées par des bandes colorées, au dessus de chacune d'elles se trouve écrit le nom de la couleur; une bande en papier blanc couvre l'inscription, et on peut la soulever à volonté. Au moyen de cette échelle, il m'a été possible de reconnaître les moindre défauts dans la perceptivité des couleurs." (Galezowski, Gazette des Hôpitaux, Septembre 1866, page 419.)

(1) Mercury interferes, according to Dr. Boëck, with the regular progress of syphilitic inoculation; in other words, retards the elimination of the specific poison.

tions of the eye, and in warding off apoplectic effusions into the choroid and retina.(1)

Time is the great eliminator of the syphilitic poison, provided the constitutional powers be maintained in a vigorous state. Other eliminants there are, such as the Hydriodate(2) and other compounds of potass, which are very useful in their place. Whether more efficient means of elimination exist in the system of local counter-irritation and in local issues of pus, or in the *sub judice* proposal of Professor Boeck of Christiania to eliminate by the skin, and so derive the virus from more important structures, we must leave to the decision of further experiment and experience.(3)

The *prognosis* is favourable if treatment be adopted early. If the disease be neglected or mistaken, more or less complete blindness is the ultimate and inevitable result.

I conclude by formulating a few of the principal points brought to your notice in this lecture:—

1. The comparatively rare disease, syphilitic retinitis, is one of the group of secondary syphilitic maladies, and makes its appearance within two years from the date of the primary infection.

2. The disease may present itself in the form of a neuritis, retinitis, choroiditis, or of a combination of two or more of these diseases;—or, it may take the form of a degeneration, without the occurrence of inflammation commonly so called.(4)

3. Those varieties in which the retina or optic nerve alone are affected, are the less frequent.

4. If the choroid be principally affected, there will be

(1). The remedy is applied locally thus:—

R. Digitaline ... 1 Centigramme.

Eau distillè... 10 Grammes.

Dissolve and instil into the eye six or eight times daily.

(2) The Hydriodate of Potass is, at times, given in very large doses with great advantage.

(3.) Professor Boeck maintains that by his system of continuous inoculations he can at last so eliminate all syphilitic virus from the infected system, that the system is restored to its original uninfected state, and is capable of shewing a positive result under a fresh inoculation, though this inoculation is not followed by secondary and other results like the first one. — *Lancet*, June 22, p. 788.

(4.) I say "commonly so called" because, strictly speaking, inflammation consists essentially of exudation (excessive proliferation of cells), with certain manifestations of local and general disturbance.

pain, flocculi in the vitreous, and rapid impairment of vision.

5. If the retina be alone affected, *instead of pain*, there will be photophobia, photopsy, (inability to distinguish certain colours?), and gradual impairment of vision.

6. The disease is symmetrical, but not generally synchronous or of equal severity in both eyes; at times the type of the disease differs in the two eyes, being more choroidal in one, more retinal in the other.

7. The pathological tendency of all forms of the disease is to anemia, atrophy, and ultimate degeneration of tissue. Relapses are frequent.

8. The diagnosis is arrived at by the help of the ophthalmoscope, the indications of which must be verified by the antecedent and present history of the case, by the absence of other disease, and by the power of mercurials to restore vision.

9. The prognosis is favourable if the disease be early detected and efficiently treated. Chronic exudations are absorbed with difficulty, and ultimate degenerations are incurable.

10. The treatment is that by rational mercurialization, followed by eliminants and by blood and nervine tonics.

ART. II.—*Remarks on some objections to certain views expressed in a paper on the Etiology of Cholera.* By R. WILKINS, Sub-Assistant Surgeon, Demonstrator of Anatomy, &c., Medical College.

IN the review of my paper on the Etiology of Cholera by Mr. Douglas, which appeared in the twenty-first number of this Journal, there are some statements which I deem it necessary to notice. I shall be as brief as possible, but before I begin, I must mention that it is not my intention to enter into a controversy with Mr. Douglas. I shall be content if I succeed in restoring any leaning in favor of the electric idea of the cause of cholera that might have been abandoned on a perusal of his paper, and for no other reason than that I am anxious that attention should be given by the medical profession to this subject; I mean, to that of electrical disturbance, and the part it plays in the causation of this disease.

Mr. Douglas denounces as worthless all my statements and explanations, because I had adopted the single-fluid theory of electricity. I did so because it suited my purpose, and I was conscious that, in adopting it, I was committing no decided or positive mistake.

The two theories regarding the nature of electricity are still extant with this difference, that the one propounded by Dufay and modified by Lymner, is the more generally received of the two.

Here follow two statements in regard to the nature of the electric fluid. It will be perceived from a perusal of these, that the Franklynian or single-fluid theory is not quite obsolete.

"The theory explaining the various electrical phenomena which is now in most favor is that of Lymner. He assumes that all matter has associated with it a certain quantity of a subtle imponderable fluid, made up of two separate conditions of the same fluid, so that in combination they neutralize one another; but when by the action of some force they become separated, the one is termed positive or vitreous electricity, the other negative or resinous. This is pure hypothesis and really means nothing, but affords a simple

method of explaining many electrical phenomena." (Braithwaite's Retrospect of Medicine, Vol. IV, 1866.)

Dr. Neil Arnot says in his work on Physics, published in 1865, "A second conjecture or theory, respecting the nature of electricity, is that there are two electric fluids, each being self-repellent, but strongly attracting the other; the two being neuter when in due degree united; but active when separated. This supposition, however little, accords with the magnificent simplicity of general nature, and many minds remain in suspense regarding it. In fact, neither theory explains all the phenomena, but either aids the students' memory by classifying the facts according to resemblances."

In Mr. Douglas' paper, page 81, Vol. XI. of this Journal, the following statement occurs: "The author (alluding to Mr. Leithead) explains a depression felt on gloomy days by the electroscope invariably indicating a negatively electrified state of the atmosphere; this the reviewer, a man of the most extended experience, points out as an assertion as the electroscope indicates no such thing." Here are two statements opposed to one another, and I submit no one is in a position to judge of the value of either without further evidence; but Mr. Douglas, notwithstanding, would have weight attached to the reviewer's opinion.

Certain conditions of the weather, in which the air is negatively electrified, are regarded, to this day, by medical men of authority, as leading to various functional disturbances of the system, cholera not exempted, from the suddenness of its appearance, so that I am not singular in holding this view. Mr. Leithead's observation, denounced by Mr. Douglas, can, therefore, I think, be relied upon.

At page 82 there is a statement which shows that he has misread the account in Mr. Leithead's work regarding the condition of the magnetic needle during a prevalence of cholera in Liverpool. Lieut. Morrison, of the Royal Navy, was the Officer who made the observation, and not Mr. Leithead, as stated in his paper. In reference to this account, Mr. Douglas says, "to this the reviewer replies that, having seen the instrument referred to, he is perfectly convinced that neither the motions nor the position of its needle are indicative of the electric state of the atmosphere, and there cannot be a doubt as to the reviewer being correct." At page 94 Mr. Douglas ventures an opinion to the

effect that the magnetic needle does not indicate the presence of atmospheric electricity, nor measures its intensity. As my object is to avoid prolixity, I will simply ask if he can reconcile the reviewer's and his own statements with the following—"the brilliant discoveries of Oersted, Arago, and Faraday have established intimate relations between the electric tension of the atmosphere and the magnetic charge of the earth." (Humboldt's *Comos*, Vol. I., page 75). "When rain is very distant from the place of observation, the magnetic needle indicates positive electricity as usual; but when it approaches within a certain distance, a powerful negative electricity is observed. * * * When rain falls vertically, the needle indicates positive electricity, but is again deflected in the contrary direction when the rain withdraws from the place of observation." (Treatise on Medical Electricity, Dr. J. Althaus.)

Mr. Douglas denies that it is possible that blood, during respiration, undergoes electrization. He thinks that chemical changes, taking place in the body, have to do with the change. If we adopt this idea, we shall then have grounds for disputing the conclusions arrived at, by Physiologists, in regard to the electrical states of venous and arterial blood. It is known that oxygen has a very high magnetic power, and may it not be that, in virtue of this power, its absorption by the venous blood in the lungs, is followed by the altered electric state?

Mr. Douglas objects to my using the phrase, loss of electricity, and at page 90 uses it himself. It occurs in old as well as in modern works on electricity.

What I stated in reference to the Kew observations, I do not think was altogether calculated to mislead. Mr. Douglas' objection to my interpretation of them, though in one sense justifiable, does not in any way militate against my idea of the cause of cholera. That the occurrence of the principal minimum in the tension of the air at two in the morning or thereabouts favors the idea, is still my opinion.

Touching my statement as to the greater prevalence of cholera in cities bordering on rivers, Mr. Douglas writes, "Evaporation is a great source of atmospheric electricity, and hence, according to Mr. Wilkins' hypothesis, persons living near rivers should not be attacked." Granted; but are there not causes which are often influencing evaporation

from the surface of rivers? Is Mr. Douglas not aware that while at times evaporation is going on rapidly, at others it is almost entirely checked? A more valid reason for setting aside Mr. Douglas' opinion on this matter is the fact that evaporation is no source of atmospheric electricity. Noad writes (edition 1859), "the principal source of atmospheric electricity was formerly supposed to be evaporation from the earth's surface: the researches of Faraday and others into the phenomena of the hydro-electric machine have, however, induced electricians to modify their views on this subject."

In my paper I stated as my belief that the electricity of the blood served in a great measure to keep up polarity of muscle. I see nothing in Mr. Douglas' objection to this view to incline me to alter my opinion. I am aware that to the chemical changes taking place in muscle its electricity is due, but electricity is not normally polar, it only becomes so under the influence of neighbouring charged particles.

I made no quotation from Mr. Reid's work; the remark therefore, "I find Mr. Reid destroys his own authority by reasoning thus," &c., was unnecessary.

Mr. Douglas writes (page 94), "Mr. Wilkins has likened death caused by cholera to the effect of lightning, but in the vast majority of cases of the latter the blood does not coagulate, nor does any cadaveric rigidity set in after death." Dr. Taylor says in his work on Medical Jurisprudence, page 756, "The blood is said not to become coagulated in the bodies of those who have been killed by lightning, while the muscles of such subjects are described as being constantly in a state of perfect relaxation, and never displaying any appearance of cadaverous rigidity. These statements are not supported by observation. Sir Charles Scudamore discovered that on examining the bodies of animals killed by the discharge of a powerful galvanic battery, the blood in the veins was always in a solid state. With respect to the alleged absence of cadaverous rigidity, there are many circumstances which may accelerate or retard the accession of this state in the dead muscle. It may take place and disappear quickly, and the subject may not be seen at that particular time by a medical examiner. Sir Benjamin Brodie remarked, "that the body of an animal killed by electricity, became as usual rigid after death."

Dr. J. Althaus writes, "According to Hunter and Himly,

muscular rigidity is not observable in bodies killed by lightning. But in this they are mistaken, as in a few cases only flaccidity of the muscles has been recorded; on the contrary, we find in most instances an extreme stiffness of the muscles which may be rigid as bars of iron."

Are washermen more liable to be attacked than others was the question put by me. Mr. Douglas replies they may be, although it may not be known, and instances a fact in which his washerman and several of the members of this man's family died of the disease. It must be remembered, the question was put in repudiation of the idea of poison as a cause of cholera, and therefore the instance cited by Mr. Douglas cannot have much weight, since the people alluded to, he says, were attacked at the commencement of an outbreak.

Sir Ranald Martin says, "the frequent communication of the disease by the bed clothes or bedding of the sick to the persons who handle or wash them under circumstances rendering other sources of infection than emanations from the bodies of the sick improbable, appear to be by no means proved. The preponderance of evidence is in fact opposed to its occurrence."

The westerly progress of the disease I endeavoured to associate with the movement of the magnetic equator from east to west. Mr. Douglas characterizes the explanation as absurd, and he states that the equator moves from west to east, and not from east to west. This assertion is clearly at variance with the following: "Morlet and Hansteen have determined the true form of the magnetic equator with great care: they have traced it over the whole globe, and have found that its motion is from east to west, in so far as can be determined by direct observation on the position of its nodes."

In one of the April numbers of either the *Lancet* or *Medical Times*, I forget which, it was noticed that a minority of the Russian Commission accounted for the westerly progress of the disease by some such cause.

In support of my views, I quoted statistics which went to show that of the European soldier, the Madras and the Bengalee sepoy, the former, namely, the European soldier, was more liable to be attacked than the native soldiers; and of the native soldiers, the Bengalee sepoy was least susceptible to the disease. The explanation of this fact proffered

by Mr. Douglas, amounts to this: that the European's proneness is due to his not being acclimatized, but nothing is ventured to account for the difference of susceptibility between the two descriptions of native soldiers.

I very much doubt whether anybody (excepting Mr. Douglas) believes that acclimatization has the effect of securing an individual against attacks of cholera.

No allusion is made in my paper to man being in a negatively electrified state when the air is negatively electrified.

In regard to blood coagulation, I said I thought that the change was due to loss of electricity, because nearly all the causes which either favor or retard the process can, in accordance with this idea, be satisfactorily explained. Cold retarding coagulation and the action of some salts in delaying the process, are no proofs against my idea of the cause of coagulation. Cold retards, because air reduced in temperature is an indifferent conductor of electricity, and hence the escape of the free electricity of the blood is slowly effected; as to the action of the salts, we are not in a position to state that it does not result in some electrical change.

Mr. Douglas' explanation of the reason why attacks of cholera frequently occur at night is diminished activity of the system due to diminished respiration. I am aware that the number of inspiratory acts is diminished during sleep, but I think what we lose on this account is compensated for by depth of the inspiratory acts. What Mr. Douglas regards as the explanation of the fact, is a mere coincidence. I ask if his explanation will suffice to account for the greater number of deaths and of births which take place at night. The reason I assigned for the frequency of cholera attacks at night can be made to apply as well to these physiological acts.

It is to be regretted that Mr. Douglas, in his learned and voluminous review of my paper, should have rather hastily arrived at the conclusion that I attempted to establish dogmatically the electric theory of the cause of cholera. I did so only inferentially, and invited enquiry in regard to the dreadful visitations of this disease, my object being, if by a correct understanding of its invasion, dispersion, progress, and termination, it might not be kept in check, and such safeguards adopted to render its visitations less frequent and its attacks confined within proper limits, instead of its approach, as at present, disturbing the face of society, and keeping men fretful during its prevalence.

ART. III.—*Inhumation in Indian Towns.* By JOHN C. DOUGLAS, Assistant Superintendent Government Electric Telegraph Department.

AMONGST the various sanatory projects for improving Indian towns, and upon which we are in a great measure to rely for the diminution of some of the most fatal diseases, this subject is not sufficiently considered. Questions concerning water supply, drainage, &c., are carefully considered and constantly agitated, and a few rules are made for the conduct of native burning ghauts and burial grounds; but burial grounds used by the European and Eurasian classes are not apparently interfered with, at least for sanatory purposes. Engineers, I believe, examine the tombs and order such as are dilapidated to be razed, but the mode of burial, situation of the ground, and the effects of these on the health of towns and individuals are apparently overlooked, and I would draw attention to the necessity for a serious consideration of this subject and an immediate reform.

To point out the effect which the present arrangements must have upon the health of towns and of the individuals immediately engaged, it is necessary to recur to what must be well known to every Medical man, but is only imperfectly known to those who must be looked to for assistance in effecting the required reform, and who hence do not assign to the subject that importance it deserves. The effects on the living organism of exhalations from putrefying bodies depend mainly on the constitution of the individual affected, the degree of concentration, and whether the person affected is or is not accustomed to such exposure.

In considerable quantities putrescent exhalations may cause epidemic disease, taking the form of malignant and putrid fevers, and less concentrated, although not producing epidemics unaided, they are sufficient to turn the balance in the presence of otherwise bad sanatory arrangements. When greatly diluted, although no effect may be apparent, by breathing air so contaminated, a tendency to zymotic disease is engendered, against which it is the first object of sanitation to guard. Taken into the lungs in a concentrated form, putrescent exhalations may cause sudden death, a weakly-constituted individual being more seriously affect-

ed than another more robust, or accustomed to such exposure; where any proneness to disease exists, putrescent exhalations may determine the body to an attack of the particular disease.

It has been asserted that persons may become accustomed to putrescent exhalations, habit increasing the powers of endurance; this is particularly the case with grave-diggers, Carpenter (Physiology), quoting a statement of M. Parent-Duchâtelet, states that workmen habitually breathe with impunity an atmosphere containing one per cent. of sulphuretted hydrogen; quoting Dr. Panum, he instances the inhabitants of the Faroë islands, who eat half-decayed maggoty flesh, fowl, or fish, as a special relish at the end of a meal. Mr. G. A. Walker (Gatherings from Grave-yards) has collected much information on this subject, and he cites several authorities on this point, notably, MM. Devergie and Orfila.

But it must not be supposed that because no ill effects are immediately apparent, therefore such do not result, for authorities are agreed that under these circumstances the blood is rendered peculiarly susceptible of alteration by zymotic poisons; epidemics rage with most exceptional violence amongst the Faroë islanders, and reference to Combe, Carpenter, Mr. W. G. Walker's book, or in fact any good manual of Physiology, will furnish innumerable instances in which epidemics have at least owed their violence, if not their origin, to such an altered condition of the blood of the victims, due to breathing air contaminated by products of putrefaction. No immediate effect may be apparent, but injury most certainly results, and the appearance of an epidemic renders this injury apparent when too late.

This effect on epidemics is not the only insidious effect of breathing air so contaminated; in conjunction with other causes, it develops consumption, scrofula, and many other diseases. Combe (Physiology applied to Health and Education, page 320), says, "All experience shews that too much importance cannot be ascribed to the purity of the atmosphere; for a small degree of impurity, constantly acting on the blood by means of the never-ceasing function of respiration, is sufficient in the end to produce a morbid condition of that fluid. The source of impurity may be exhalations from the soil, or so bad a construction of our houses, that fresh air is excluded while the exhalations of the animal

"body are confined and condensed, intermittent and remittent fevers generally owe their origin to the former cause; "typhus fever, scrofula and consumption, most frequently to "the latter." And again, speaking of the death-rate in towns, he says, quoting a report of the Registrar General, "the excessive mortality from diseases of the zymotic (epidemic and "contagious) and other classes observed in towns, is occasioned by animal or vegetable poisons with which the atmosphere is charged in different degrees of concentrations."

"Opinions differ as to what fraction of the suffering and death is to be set down to the want of water or of sewerage, crowded lodgings, narrow streets, ill-ventilated workshops, the destitution of skilful medical advice, the neglect of children, doses of opium and overflowings of quackery, slaughter-houses and rank churchyards; * * * the question of the amount of each individual influence is shewn to be of no importance. The work of amelioration must be directed against one and all."

Incineration seems far more adapted to communities than inhumation; it disposes of all the difficulties of the subject in the most satisfactory manner, as the products of the decomposition are in this case by no means so injurious to life when they can be effectually diffused; putrefaction is, of course, entirely prevented, hence the putrescent products from which so much is to be apprehended, have no existence.

But, although, both chemically and physiologically, burning in the presence of a current of air, ensuring the destruction of all products which might afterwards putrefy, is the best measure for meeting the exigencies of the case, no person could propose such a measure with any hope of its being adopted. It has been urged that inhumation is the oldest way of disposing of the dead, that it has been most generally practised, that it has most advantages, and is indicated by nature; but religious prejudices appear really, as at least the main cause of inhumation being so generally retained. That it is the oldest, does not prove it is the best; if it did, age would be an argument against all progress; that it has been most generally adopted, does not prove it should always be retained. Chemistry is a modern science, and clearly points to incineration as best adapted to the requirements of communities; not being productive of disease,

it is evidently the most natural, there being a powerful motive for its adoption in the instinct of self-preservation. But the little hope of bringing about its adoption is quite sufficient to deter any reasonable person from seriously proposing it, and attention must be directed for the present to inhumation as more consonant with prejudices which, I am constrained to admit, have more weight with the vast majority than scientific demonstrations.

The most strenuous supporters of inhumation appear unanimous in insisting on four conditions—namely, that it should not be permitted in the neighbourhood of human habitations, particularly within towns; that the body should be placed in the earth direct, and not in vaults or other structures; that it should be buried from six to eight feet from the surface, and that no grave should be opened until complete decomposition had taken place—a length of time, varying according to circumstances.

Observance of the above precautionary conditions is of more importance in India than in Europe. Native quarters of towns are often densely overcrowded, the dwellings badly ventilated, the inhabitants dirty, and unmindful (principally through apathy and ignorance) of the most ordinary sanitary precautions, the temperature as a rule is high, the drainage and water supply defective; &c. I have neither time nor opportunities for thorough investigation, but sufficient has come under my observation to warrant me in calling attention to the subject, and, convinced as I am of its importance, and of the existence of a dangerous disregard for the public health, I feel that in thus calling attention to the subject, I am merely fulfilling a duty.

Are burial grounds in India placed at a distance from human habitations? In some instances they are, but in very many they are not; to take Madras as an example, a presidency town with an expensive Municipal Commission, the burial grounds are (in a sanitary point of view) as badly situated as they possibly could be. An inspection of a plan of the town will convince any impartial person of the truth of this assertion: they are situated as follows—a batch of several at Washermenpettah, about a quarter of a mile from the Monegar Choultry, Leper Hospital, and Poor House; the General Cemetery and Vepery Burial ground are close to Vepery Hospital and Perambore lines, and St. Andrew's, St. Patrick's, and St. Mary's Burial grounds are situated on

the island to seaward of the town, thus intercepting the sea breeze, and these are surrounded in close proximity by the General Hospital, the Penitentiary, a School, and the Body Guard Lines.*

The situations of the abovementioned require no comment, and, so far as I have observed, Madras only affords an example of what may be found elsewhere. Bodies should be buried in the earth direct and not in vaults or other structures, but this precaution is disregarded, and it is to this practice of burying in vaults, particularly in towns, that the greatest attention should be paid.

From my own observation, the following appears a common mode of procedure:—an order being given for a brick vault, a pit is dug and four walls run up to form a grave, the coffin (an ordinary wooden one *without any leaden shell or other means of hermetically sealing it*) is placed in this pit, a very thin layer of earth is thrown over the coffin, and a man turns an arch over the grave. I have seen a workman some days after a body had been so deposited, doing this work with persons, who appeared to be, his wife and child sitting at the side of the grave, apparently taking a meal. After some days the arch is completed, and the top levelled; a hole is now dug at one end of the vault, and a hole made through the end wall, in order to admit of thin layers of earth surrounding and covering, the coffin being removed and of a man going inside with the putrefying corpse to plaster vault roof. This operation may occur a week or ten days after the ceremony of burial; a fœtid odour may be detected some yards from the hole, and the exhalations, as I have experienced in my own person, may at this distance bring on very unpleasant symptoms.

The danger of this operation of plastering the roof of a small chamber having no ventilation but the man-hole for entrance and exit, in the presence of a putrefying corpse, is fully recognized by the men employed, and they have to be paid accordingly. Delirium and prolonged insensibility are, I am credibly informed, an occasional result. In one case which was related to me by the best authority, a man was insensible for five days, in consequence of exposure to exhalations from a body, either during the opening

* To this list may be added the burial ground of St. George's Cathedral, which is to windward of the leading thoroughfare and the most fashionable quarter of Madras.—Ed.

or plastering of a vault, I do not remember which, but in either case equally a disgrace to our civilization, and calling for immediate interference. Bodies remain thus virtually unburied in the midst of a populous town, in a hot country, for a period varying from a few days to ten or twelve, perhaps in some cases longer. The evil effects of burying in these small vaults are, not only that the grave is kept open and the health of the population is endangered thereby, but, that even if covered in the same day, the air may still be poisoned by the exhalations. The smallest hole, a fissure in the brick-work caused by putting on a heavy stone, is sufficient to allow the gaseous and suspended products of decomposition to escape, and the quality of the brick-work is certainly not the best.

But even supposing the brick-work good, and that it remain uninjured until the body is entirely decomposed, the gases may be diffused through the bricks (which are very absorbent) and thus given off to the air. During wet weather the bricks becoming damp and the gaseous products being mostly soluble in water, these latter might be absorbed on the inside and given up to the air on the outside. Even if the vault were hermetically sealed, the accumulation of such gases, with the danger of their being accidentally or intentionally set free, should be strictly prohibited within towns.

The small vaults are often opened to admit another coffin; this operation is admitted to be dangerous to the health and life of those engaged in it, and it must frequently allow the escape into the air of products of decomposition, highly dangerous to the public health. The opening of such closed vaults should, except under very exceptional circumstances, be strictly prohibited, but if permitted should be conducted in the presence of a qualified official who would take proper precaution to prevent accident.

I believe I have written quite sufficient above to shew the necessity for reform in the matter of the burial of the dead, resigning all hope of ever seeing incineration adopted. I have pointed out that inhumation is practised in a manner tending to injure the public health, and I may conclude by urging the necessity for the following rules being strictly enforced:—

All burial grounds should be situated at a considerable distance from the habitation of the living;

No burial ground should be situated to seaward of a town, or in such a situation as to intercept the principal winds blowing over a town;

Brick graves should be absolutely prohibited, a minimum depth for graves should be prescribed;

No graves should be disturbed within a prescribed time, except upon an order from a Magistrate or other official, to be granted on proof of necessity or expediency.

Some person should be made responsible that such precautions are taken as are necessary to prevent injurious consequences to workmen immediately engaged during any operation connected with inhumation of the dead.

Dr. Carpenter in his *Human Physiology*, after pointing out that by due attention to the various means of promoting atmospheric purity, "the rate of mortality may be enormously decreased, the amount and severity of sickness lowered in at least an equal proportion, and the fatality of epidemics almost completely annihilated," goes on to say, "And it cannot be too strongly borne in mind, that the efficacy of such *preventive* measures has been most fully substantiated, in regard to many of the very diseases in which the *curative* power of medical treatment has seemed most doubtful; as for example, in cholera and malignant fevers."

NOTE.—We reprint the regulations enacted in Sections 194 to 197 of the recently sanctioned Madras Municipal Act of 1867.—ED. M. Q. J.

"194. The Commissioners may, if they think fit, cause a survey and measurement to be made of every burial ground and every place used as such; and every such place, and every burning ground, existing at the time this Act comes into operation, shall, within one month after this Act shall have come into operation, be registered by the owner or the person having the control thereof, or, if there be no owner or person authorized to control the same, by order of the Commissioners, in a book to be kept by them for that purpose; and whoever, after the expiration of the said time knowingly buries or burns, or causes, procures, or suffers to be buried or burned, any corpse in or on any ground not so registered as a burial or burning ground, shall be liable to a penalty not exceeding one hundred Rupees."

"195. No vault or grave shall be made within the walls of, or underneath, any church or chapel or other place of public worship built within the Town after this Act comes into operation, and no burial or burning ground, whether public or private, shall be opened, made, or formed, within the Town, after this Act comes into operation, otherwise than by, or under the authority of the Government, without a license, describing the extent and boundaries thereof, first obtained from the President, who is

hereby empowered, at his discretion, from time to time, to grant such licenses; and whoever shall bury or burn, or cause, permit, or suffer to be buried or burned, any corpse in any vault, grave or burial or burning ground, opened, made, or formed without such license, or contrary to the terms thereof, or in any public or private place, shall be liable to a penalty not exceeding five hundred Rupees."

"196. If, upon the evidence of competent persons, the President, with the sanction of the Government, shall certify, in manner hereinafter provided, that any burial ground or place of burial, or any place used for the burning of corpses, within the Town, is in such a state as to be dangerous to the health of persons living in the neighbourhood thereof, or that any church or other place of public worship within the Town is dangerous to the health of persons frequenting the same, by reason of the state of the vaults or graves within the walls of, or underneath, the same, or in any churchyard or burial ground adjacent thereto, and shall also certify that a fitting place for interment or burning as the case may be, exists within a reasonable distance and is available, it shall not be lawful, after a time, not less than two months, to be named in such certificate, to bury or burn, or permit or suffer to be buried or burned any corpses, in, upon, within or under the ground, church, or place of worship to which the certificate relates, except in so far as may be allowed by such certificate; and whoever, after due publication of such certificate as hereinafter provided, buries or burns, or causes, permits, or suffers to be buried or burned, any corpse contrary to this enactment, shall be liable to a penalty not exceeding two hundred Rupees. Provided always, that every such certificate shall be published in the Government Gazette, and that a translation thereof in the vernacular language chiefly in use shall, in the case of a burial or burning ground, be affixed conspicuously on some part of the said ground."

Commissioners shall provide places to be used as burial or burning grounds.

"197. The Commissioners shall from time to time, out of the Municipal Fund, with the sanction of the Government, provide fitting places to be used as burial or burning grounds."

ART. IV.—On the *Chinchona excelsa* of Roxburgh. By J. BROUGHTON, B. Sc. Lond. F.C.S., Quinologist to Government.

AMONG the numerous indigenous febrifuges of this country, one of the most interesting is the bark of the *Hymenodictyon excelsum* (Wallich.), or pundaroo. The considerable interest attached to this plant does not depend so much on its proved efficacy in medicine, as upon its history and botanical relations. Belonging to the same natural order as the true *Chinchona*, it so greatly resembles them in appearance, that for many years it was known by the name of *Chinchona excelsa*, which was, I believe, bestowed upon it by Pennant. Being thus considered the only *Chinchona* indigenous to India, very considerable expectations were entertained that it would be found at least a most valuable febrifuge, if not an actual source of quinine. This opinion was to some extent corroborated by the bitter taste of the bark, and by its being used as a febrifuge among the natives. Roxburgh* states that "the inner coat of the bark possesses both the bitterness and astringency of Peruvian bark, and when fresh, in a stronger degree; the bitter, however, on chewing is not easily perceived, but is more lasting." Ainslie, speaking of the various substitutes that had been recommended for Peruvian bark, mentions the bark of *Chinchona excelsa*, as having been ascertained to possess powerful tonic, and antifebrile virtues.

O'Shaughnessy speaks of the bark as follows:—†

"The two inner leaves of the bark possess great bitterness and astringency, the bark is used by tanners, and also as a medicine among the Hindoos, in cases requiring astringents."

"We have analyzed the bark of *Chinchona excelsa* from the botanic gardens of Calcutta; but could not detect any alkaline ingredient: nevertheless, the trees of hilly regions may furnish the valuable desideratum. The stamina being contained within the tube, affords much ground for expecting the discovery of a febrifuge alkaline in this species."

The plant to whose bark the abovementioned virtues are

* Flora Indica, vol. ii. p. 149.

† Bengal Dispensatory, 1842, pp. 394, 395.

described, is a fine timber tree. Its handsome foliage might easily be mistaken by an observer not acutely botanical for that of *Chinchona Peruviana*. Its bark is thick, with a liber of loose texture, but abundant in large woody cells, which are thickened and hardened by ligneous deposits, so that they produce an almost gritty sensation when placed between the teeth. The bark possesses the remarkable property of being very bitter when quite fresh, but of this bitterness diminishing on keeping, so that after a few days it has so decreased, that the bark becomes nearly tasteless.

The foregoing circumstances induced me to submit the bark to a careful chemical examination, in the hope that I might be fortunate enough to discover a proximate principle; whose constitution might perhaps throw some light on that of the true *Chinchona* alkaloids.

By the kindness of Major Morgan, Deputy Conservator of Forests, I obtained a supply of the fresh bark from the neighbourhood of Mudumullay. From it I was finally successful in obtaining the bitter principle in a pure crystalline state. After many trials, I found the following simple process enabled me to obtain it in considerable quantities.

The sliced fresh bark is boiled with water till it becomes somewhat soft, when it is drained and squeezed through a cloth. The bitter decoction thus obtained is carefully evaporated to a small bulk over an open fire when it is mixed with a sufficient quantity of calcined magnesia to render it of a creamy consistency; after which it is evaporated to dryness by steam-heat. The residue is then powdered, placed in a flask and repeatedly exhausted with strong alcohol, and filtered. The alcoholic extract thus produced is magnificently fluorescent, surpassing in this respect a solution of sulphate of quinine. The alcohol is then nearly removed by distillation, and the liquid residue is set aside in a cool place for twelve hours; when the whole solidifies into a mass of fine white prismatic crystals, which can be obtained quite pure by two further crystallizations from water.

The crystals are somewhat sparingly soluble in cold water and alcohol; but readily dissolve in those liquids when boiling. The solutions are beautifully fluorescent; but they lose this property by the addition of a drop of hydrochloric acid. When boiled with the latter re-agent, and the solutions

subsequently poured into a hot alkaline solution of a cupric salt; a precipitate of red cuprous oxide was immediately formed. An aqueous solution of the crystals only precipitated the cupric solution on prolonged boiling. The substance therefrom appeared to be a conjugate compound of grape sugar.

The purified crystals were dried in vacuo over sulphuric acid for a few days. They were then submitted to analysis, and yielded the following numbers:—

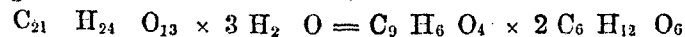
I.—0.4793 grm. burnt with cupric oxide, yielded 0.9147 grm. carbonic acid, and 0.2209 grm. of water.

II.—0.4176 grm. yielded 0.7937 grm. carbonic acid, and 0.1995 grm. water.

I found, on comparison, that the foregoing numbers closely correspond with those yielded by æsculin, the fluorescent and crystalline principle of Horse-chestnut bark, discovered by Frischmann, and subsequently analyzed by Fromsdorff in 1835.* This is clearly shewn by the following comparison. Æsculin.

	C ₂₁	H ₂₄	O ₁₃		I.	II.
...	252	...	52.06	...	52.04	51.90
...	24	...	4.96	...	5.12	5.31
...	208	...	42.98	...	42.84	42.79
...	—	—	—	—	—	—
	484	100.00	100.00	100.00		

Rochleder and Schwarz† found that on boiling Æsculin with hydrochloric acid, it split up into æsculetin and grape sugar.



When the crystalline substance obtained as above is boiled with hydrochloric acid for a few minutes and allowed to cool, long needle-like crystals having all the appearance of æsculetin, separate. When these latter are boiled with a solution of Ferric chloride, a fine green coloration and precipitate are produced. This reaction is characteristic of æsculetin. I consider it therefore proved that the crystalline

* Annalen, chemd. u. Pharmacie Bd. xiv. 193.

† Ibid, lxxxvii. 186.

substance obtained from *Hymenodictyon excelsum* is identical with æsculin.

It is a somewhat singular circumstance that the bitter principle of this Indian tree should be the same as that of the Horse-chestnut. The complete identity in the behaviour of the two substances leaves, however, no room for doubt. It is also remarkable that Horse-chestnut bark has obtained a reputation on the continent of Europe of being, like the *Hymenodictyon* in India, a good substitute for *Chinchona* bark. Lindley and other authors mention that it has been recommended as a valuable febrifuge in intermittents.

The occurrence of the same principle in genera, so widely separated (botanically) as *Hymenodictyon* and *Æsculus*, will recall to mind the more famous but parallel instance of the common constituent of tea and coffee. But in the former case there is a further interesting link of connection. In a recent exhaustive chemical examination made by Rochleder of the cotyledons and bark of the Horse-chestnut, he found as a constituent of the former a substance isomeric with quinin, the bitter constituent of *chinchona* leaves. The full significance of these coincidences will, doubtless one day be made apparent.

The fluorescence of a slightly alkaline solution of Æsculetin, is the most beautiful instance of that phenomenon that has ever come under my notice. It is finely seen when the solution is illuminated by the light of sulphur burning in oxygen.

The cause of the loss of bitterness which the *Hymenodictyon* bark suffers by keeping, is now readily explained. Æsculin by contact with changing organic substances, becomes slowly converted into æsculetin and glucose, by the same decomposition that can be more immediately produced by boiling with acids. When a solution of æsculin is mixed with emulsion of sweet almonds, the change takes place in about two days. The soluble bitter substance of the fresh bark gradually changes into the sparingly soluble æsculetin, which has comparatively little taste; the bark becoming less bitter from day to day. That this is really the case can be experimentally shewn by boiling a few fragments of the dry bark in a test tube with some water. On cooling, an abundance of glittering crystals will be deposited;

which can be readily recognized by their form; and their behaviour towards polarized light. They form beautiful microscope objects. Perfectly fresh bark yields no æsculet when thus treated.

The bark of *Hymenodictyon excelsum* differs entirely in its chemical character and products from *Chinchona* bark. Containing no trace of quinine or related alkaloid, the expectations once entertained of its medicinal value appear to have but little support in fact.

ART. V.—*Pisciculture on the Neilgherry Hills.* By

FRANCIS DAY, F.L.S. & F.Z.S., Principal Medical Store-keeper, Madras Army.

THE diffusion of useful plants and animals, has, more especially of late years, received much public attention, and means have been successfully adopted to extend to distant and suitable regions, objects, which may either augment the existing luxuries of man, or increase the food-producing powers of the spot wherein he has fixed his home. Acclimatization Societies, Governments, and private individuals have all assisted in this laudable undertaking, the ultimate aim of which is, to increase the present means of nourishment attainable by the human race from both the land and water. Even when the result is small, it should not therefore be despised, for something may be learnt from every experiment, which, especially if successful, may point out how larger undertakings can be carried out in other localities; whilst accounts of each failure are also useful, serving as warnings against future attempts being made in an identical manner.

India, which has given to the world many useful commodities and has assisted in stocking far distant lands with treasures that were originally confined to her own shores, has, until of late years, had but few attempts made to increase her natural riches. Her conquerors have been too much absorbed in warfare, political discussions, and the definition of civil rights, to turn their attention—excepting in times of famine or for purposes of taxation—to her resources. Elsewhere man has been the active means of disseminating many objects amongst the Flora and Fauna of the globe, had he not done so, some portions of the world would not be so well adapted for his residence as they now are. Well known examples of this are afforded by rice, which has been naturalized in America, by the sugar-cane which now thrives in lands far distant from that in which it originally existed; by cotton which has become one of the chief staple commodities of the Southern States of America, and by potatoes which have been extended over the civilized world.

As in the vegetable so in the animal kingdom, wherein whole families obtained from distant climes, have adapted

themselves to lands in which they were not indigenous. In truth, the apathy which would rest satisfied with the animals to be found in each locality, and neither takes steps to protect the existing creatures, nor augment the supply of sustenance by the importation of new species from other parts, would be rather what might be expected from a savage than a civilized people.

Amongst the animal productions of India, fish meet with the least sympathy, and the greatest persecution, especially as regards the fresh-water tribes, which have to struggle for bare existence in rivers which periodically diminish to little streams, and often dry up during the hot months; or in tanks from which the water totally disappears. Besides these, and many other disadvantages, they have their natural enemies in the ova state, in youth, and maturity, but amongst these foes, mankind is perhaps the greatest. A fish diet is much esteemed and procurable at comparatively a cheap rate, because these unfortunate creatures are captured by every one who gets the chance; the larger species are killed irrespective of time or season; the young are destroyed for curries, water-courses are poisoned for the purpose of obtaining them in large quantities for salting and transmission to distant markets; whilst they meet with no protection even from inferior foes. Now that every article of consumption is increasing in value, the propagation of fish must become a subject worthy of great consideration, especially as they live in places which are otherwise unserviceable to man in the production of food, excepting in a secondary manner; whilst no grain is required for their support, but little trouble for their protection, and they thrive in places which but for them would be deserted wastes. Were it not for the vast numbers of eggs which fish deposit, the probabilities are that long ere this, they must have been exterminated in India, excepting in thinly-populated or uninhabited districts, for man allows them no law, and were they noxious reptiles could not more anxiously compass their destruction.

In the time of Hyder Ali, enactments existed for the protection of fresh-water fish, one of which was, that whoever captured them without possessing a license should suffer the amputation of a hand, and even at the present time fishermen in the Mysore territory are obliged to pay yearly for permission to use nets. But now, with this exception, the piscine tribes seem to have fallen on evil days, being

only protected in or near Hindu temples, for in fact elsewhere they appear to have been permitted to exist, solely because man has been unable to destroy them. It is to be hoped that something will now be done to protect and propagate the better species, especially in cantonments where there are European soldiers, near large Native towns or where anicuts have been formed, so that the food-producing capabilities of the fresh waters of India may be largely augmented.

In consequence of fish being able to retreat into deep pools, or under overhanging banks during the heat of the day whilst they ascend to the surface and sun themselves in the shallows when it is cool, they are not so susceptible to atmospheric changes as are mammals and the dwellers on land. This has been taken advantage of, and the gold Carp of China *Puntius (Cyprinus) auratus*, Linn., are now naturalized in most of the countries of Europe, whilst the common Carp *Cyprinus carpio*, Linn., which is a native of the south of Europe, was first brought to England in 1514, and to Denmark in 1560, but in the latter country they do not appear to have done so well, as Bloch writing in 1782, observes, that owing to the degeneracy of the species in the north from the coldness of the climate, several vessels were yearly despatched from Prussia to Stockholm with further supplies of live fish, for although they bred in their new home, the young degenerated. But with regard to the result of acclimatization in the East, we find that the Gouramy *Osphromenus olfax*, Com., an excellent fresh-water fish, an inhabitant of China, which grows to 20 lbs. in weight, appears to bear a change of climate well; it was first imported into Batavia, then into the Mauritius, from whence it has been extended into Bengal and Madras, &c., now on to the Neilgherries; it has also been naturalized in Cayenne, and in 1864 in Australia⁽¹⁾. With the exception of the introduction of the Gouramy and some other species of Chinese fish at the end of the last century into Bengal, and this year that of the Gouramy from the Mauritius into Madras, no attempts have hitherto been made in India by the European governing powers to advance pisciculture by the introduction or dissemination of useful fish or the protection of the indigenous sorts. Hyder Ali is reputed to have placed the Milk fish *Chanos argenteus*, Bloch, in some

(1) M. Koltz, *Traité de pisciculture pratique*, 1866, p. 67.

of the tanks in Malabar, and natives generally store newly-made pieces of water with fish from the nearest locality, irrespective of whether they are those best adapted for that purpose or the reverse.

When at Ootacamund in 1863, I observed the deficiency of fish in the waters on the upper plateau of the Neilgherries, which, on a superficial examination, appeared well adapted for European species. Several persons also expressed their desire that I should suggest some plan by which this deficiency might be remedied, and it appeared probable that Government might be induced to second some attempts being made for this object. If there were fish in sufficient quantities, I considered they would serve two purposes, one as an article of diet, the other as an amusement for the numerous convalescents, whom it is needless to observe frequent the Neilgherries as a sanitarium from all parts of India. That fish would be highly esteemed as an article of food, was shewn by the high prices obtained in the Bazaar for those brought up from the plains, viz., Eels, *Muræna maculata*, Ham. Buch.; Murrul, *Ophiocephalus striatus*, Bloch, and *O. marulius*, Ham. Buch.; Koravas, *O. gachua*, Ham. Buch.; Wahlahs, *Wallago (silurus) attu*, Bloch., and *Wallago (silurus) malabarici*, Cuv. and Val.; Katuruas, *Hemibagrus (bagrus) punctatus*, Jerdon; and *Hypselobagrus (silurus) cavasius*, Ham. Buch.: besides several species of carp and some small salt fish from the sea coasts.⁽¹⁾

The Neilgherries are a range of Hills in the Madras Presidency, abutting on the Collectorates of Malabar and Coimbatore, being 40 miles from the nearest point of the coast in the former district, and 230 from that of Coromandel. They are situated between the 11° and 14° of North latitude, and the 76° and 77° of East longitude, and have an area of about 700 square geographical miles. They rise abruptly from the plains on every side, excepting that of Mysore, with which they are connected by a narrow slip of elevated land. Their greatest extent is about 50 miles, from South-West to North-East, whilst their extreme breadth is about half that distance, these measurements

(1) Having sent to the Ooty Bazaar for one anna's worth of salt fish, I obtained three ounces weight of exceedingly badly dried sea and estuary species. None were upwards of four inches in length, and they apparently came from the Western Coast. They consisted of the following species. *Equula insidiatrix*, Bloch; *Atherina Forskalii*, Rüppell; a species of *Ambassis*, *Polygmus Hemiramphus*, and *Chatoossus*.

being taken from the bases of the Hills on either side. The plateau may be considered to extend from 30 to 40 miles in length, by from 8 to 15 in breadth.

The Hills "are composed⁽¹⁾ of three distinct ranges or "groups of hills closely connected together, but which, "though nearly of the same general elevation, vary considerably in their aspect, connection, and grouping.

"The range to the Westward though forming a continuous line, bears two distinct names. The Northern part "forming a narrow line commencing at the Goodaloor Pass, "being called the Neddimala Hills; and the Southern "division, composing a very distinct and remarkable group, "being known as the Koondahs. The central or principal "range is entirely formed by a continuous chain of hills "rising gradually on each side to the summit of Dodabetta, "the highest of the whole group, and the loftiest point yet "discovered South of the Himalayas, being 8,760 feet above "the sea level."

It is with localities in this last range only that these pages are concerned, it being almost the only portion inhabited by Europeans, besides being most easy of access, and supplied with streams and pieces of water, all of which contain a maximum quantity of nourishment suited to the existence of fish, and a minimum quantity or total absence of the latter; consequently, the artificial increase of the better species from other parts would augment the nourishment derived from the hills themselves, besides affording an agreeable variety of diet to those residing on them, therefore fish should undoubtedly be developed and propagated to an extent only limited by the amount of space and food necessary to their well-being. The insects, shells, plants, &c. found in the waters, are at present useless to man, excepting as affording food for fish. Consequent upon the Neilgherries having only been known to Europeans, excepting in the most casual manner, during the last half century, attention has not been sufficiently drawn to the advantages which pisciculture might develop, but as the European element in the population has increased, this want of fish has become more and more apparent. It is considered in Europe that the revenue derivable from water ought to equal that from land, and to a great extent this should hold good in India: but the first step must be the

(1) Baillie, *Neilgherries*, Second edition, 1857, pp. 51, 52.

study of this branch of natural history, as fish, unless well preserved and attended to, will be of scarcely more pecuniary benefit than land which remains uncultivated.

The smaller species of fish partially serve for the sustenance of the larger, and in India where the carnivorous tribes predominate in the fresh waters, there are millions of tadpoles and frogs which, although unsuitable for human food, form excellent sustenance for fish, and may thus help to adorn our tables and minister to our luxuries and necessities.

The pieces of water on the hills which from their size appear to be best adapted for the abode and propagation of fish, are the Ooty Lake, the Pykara and Avalanche rivers.

The OOTY LAKE, situated 7,600 feet above the level of the sea, is nearly $1\frac{1}{2}$ miles in length, and would admit of great extension, were a bund placed some miles lower down the present stream. In some parts it is of considerable breadth, and very deep. It has been formed by a dam thrown across the openings between two hills. At the upper or south end it is constantly fed by a small stream, which escapes by an overflow, under a bridge at its lower or northern extremity, but the great bulk of the water is derived from the heavy rains during the Monsoon. It is divided into two portions by a bund, under the centre of which is a bridge. The upper part of the lake is small in extent during the dry months, and has rank grass growing along its sides and on the little Islands which are dotted over its surface, whilst it is exceedingly dirty from the deposits either washed down from higher levels during the monsoon time or thrown into it from the Native Bazaar which extends along its Eastern side, it is also gradually silting up from the mud washed into it during the Monsoons, or purposely conveyed there from the cutting on the road to Coonoor. The lower and largest portion of the Lake is clear, broad, and deep in places; Grebes, *Podiceps Phillippensis*, a few Moor-hens, *Gallinula chloropus*, and occasionally a Coot, *Fulica atra*, may be seen swimming about on its surface; the two former species breed there. The Brahminee Kite, *Haliastur Indus*, and Common Kites *Milvus Govinda*, are generally skimming above the water, and the little Kingfisher, *Alcedo Bengaliensis*, hovering about. Leeches abound, there is also a very large *Nepa*, some water-beetles and numerous *Lymnea*, whilst along the

margin during the warm weather dragon flies may be seen in myriads. Frogs and crabs are not so abundant as in many other pieces of water on the Hills. The temperature of the water appears to be almost invariably higher than that of the air.

The PYKARA RIVER takes a winding, Northerly course, diverging both to the East and West, it is at least ten miles in extent from the Makoorty Peak to the falls. It passes along the base of, and between granitic hills, and subsequently joins the Moyaar which at a distance skirts the Northern side of the base of the Neilgherries, and ultimately becomes incorporated with the Bowany near Danaikencotta in the Coimbatore district. Near the Traveller's Bungalow at Pykara, ten miles by the old road from Ooty, the river is about forty yards wide in the dry season of the year, and contains a succession of deep pools divided by shallows, in which are large boulders of rock. On the fords the beds are gravelly, but covered by a fine red sand with which the water appears impregnated. There are a few trees along the banks, which in places are moderately high. In wading across the stream, a person's legs are immediately attacked by numerous fine leeches which absolutely swarm in the water. Crabs are captured at every throw of the cast net, Frogs abound, as do also the Ephemera of the Dragon fly at certain seasons, and a large *Nepa* is also occasionally perceived. Otters are sometimes seen on the banks of the river, and the minute Kingfisher is not rare. The temperature of the water, from a few observations made, seems to be rather colder than what obtains in the stream at Coonoor.

The AVALANCHE RIVER is fifteen miles by the road from Ooty, and not far from the Bungalow of the same name, it is 6,725 feet above the level of the sea. It flows from West to East, taking a winding course amongst the Hills, during which it is fed by numerous small rivulets. Eventually it flows into the Bowany which skirts the Southern and a portion of the Eastern bases of the hills, and after receiving the Moyaar, becomes incorporated with the Cauvery not far from the town of Bowany. Near the Avalanche Bungalow the river is from thirty to forty feet in width, it is very clear, and in the dry season shallow, as the deep pools at other times present have then disappeared, consequently at midday the temperature is high. The bed of the river is of granitic rock, full of small boulders of stone, in-

termingled in places with large boulders, and small gravelly and sandy beds. In parts the banks are high, but not wooded. On displacing the stones in the river, innumerable ephemera of the dragon flies are disturbed, some of which are of a large size, there are also numerous water-beetles, crabs, and frogs, but leeches appear to be absent.

There are other smaller pieces of water on the Neilgherries which require a short description here, although, for reasons which will be subsequently entered into, it was not proposed to stock all of them with fish.

There is a fine pond under Burnfoot, close to the public road on the Ooty side of the Kaity ghaut, which, when this experiment was commenced, was destitute of fish, but I have now placed some Koravas *Ophiocephalus gachua* Ham. Buch., in it to be available in case of any accident destroying those in the Lake; in fact, as a supplementary stock, which it is to be hoped will not be required. The trunks of trees in this pond would make it difficult to net. There are also a few other ponds in Ooty.

The BILLICUL LAKE, or tank, is about eight miles from Ooty, and six from Seegoor a small village situated at the foot of the Hills on the Mysore side: it is probably about 5,700 feet above the sea, and when the house there was first built by Mr. Rumbolt as a shooting-box, was a small natural tank. It was in 1844 enlarged by Mr. Martelli, who then owned it. It was first stocked with fish from the plains by Mr. Rumbolt about 1839, and restocked by Mr. Martelli, with the assistance of Mr. John Sullivan the Collector. The fish were obtained from the Seegoor river and also from Barra, situated at the confluence of the Moyaar and Seegoor rivers. These fish have increased to a great extent, and from the situation of the Lake, more than half way between the low country and Ooty, they are well acclimatized for transferring to the higher waters. Unfortunately, its bed is so full of large stones and trunks of trees, that it would be almost impossible to remove fish once placed in it, otherwise it would form an excellent dépôt.

At Coonoor there are a few small tanks, but with the exception of one at Inkerman, 50 x 100 feet in extent, there are no places adapted for the reception and propagation of fish. A small tank at Woodcot was employed by me during the progress of the experiment for keeping the fish in for a few days when they were first brought up from the low

country, but the bottom was very foul, fortunately there was a stream running through it, which could be turned on or off at pleasure.

In this place it may be as well to give a short account of the rivers which skirt the base of the Hills below the Seegoor and Coonoor ghauts, for from those places only can fish be brought up to Ooty. The examination of these pieces of water occupied much time.

The small SEEGOOR RIVER, about 2,900 feet above the level of the sea, is formed by the Ooty stream, one branch from Marlimund, and another from between Marlimund and Billicul. It joins the Bowany at Barra, about seven miles from Seegoor, to the right of Tippoo-cardoo. It is at a much higher elevation than the Bowany at Mettapolliam, and not above twelve miles from Ooty, whereas the latter is twenty-five, therefore did it contain the fishes required, and could a fisherman and coolies be procured there, it would be best adapted for stocking the Hills. But unfortunately owing to its feverish locality, coolies cannot be obtained there, and the only fisherman in Ooty positively refused to go for more than one day. This difficulty, however, I partially obviated by making a drag-net, and taking coolies with me to use it. I also made arrangements with a writer at Seegoor to send me carps captured with a rod and line. The bottom of this river is full of boulders of stone, and contains some deep pools divided from one another by fords. The banks are covered with trees.

The CULHUTTY STREAM is the continuation of that from Ooty: before it reaches Seegoor it is joined by a small one from Marlimund, and is of the same description as the others. Behind the Traveller's bungalow is a waterfall with a deep pool below, whilst lower down, two or three other tributaries join it. The stream is capable of damming across, and would form a good dépôt for carp, brought up from Seegoor, for conveyance to the upper plateau of the Neilgherries, but unfortunately there are many holes in its bed, and the little fish hide themselves under the stones, and are difficult and sometimes impossible to capture, whereas should any sudden storm occur, the dam would be washed away and with it the fish.

On the Cleveland Estate, a coffee plantation belonging to Captain Fuller, about ten miles from Kotagerry, and six above Shemogah, at an elevation of probably 3,000 feet

above the level of the sea, is a stream about twenty feet in width. The bed is rocky, but contains pools about five feet in depth, between which the fall is great, in one place as much as one foot in four. In this stream are some *Barilius rugosus*, (Day), or Indian trout, which grow to about six or eight inches in length, and are of the same species as those in the neighbouring low country, they are hardly adapted for pisciculture, neither is the stream of sufficient size for that purpose, but their presence in this spot, proves that there is no fear that fish will be washed away in such large streams as the Pykara river. About a mile lower down the stream, is found a species of carp *Puntius Grayii* (Day), which is also too small to be of any service, and a small Loach *Nemacheilus Güntheri* (Day), which is also found in a little stream between that place and Kotagherry.

The CARTERRY STREAM as it passes Kaity, en route to the low country, when it joins the Bowany, contains some small Minnows of the same description as those found on the upper plateau of the Hills. Otters are numerous there.

The BOWANY RIVER, at first skirts the base of the Hills, but diverges as it approaches the Hullicul Droog, so that it is five miles from the base of the Coonoor ghaut at Mettapolliam, where it is about 1,000 feet above the level of the sea. It is broad, and never dries up, even in the hottest seasons. It receives the streams from the South and East of the Neilgherries, as well as from the Calicut district, consequently, although the South-west Monsoon does not extend as far as Mettapolliam, still the river at that time is very full. It is affected also by the North-east Monsoon. Its bed is granitic, with large and small boulders of stone, so that a drag-net cannot effectually be used in it, consequently, only cast-nets are employed. The banks are finely wooded in places, and it surrounds many Islands in its course. During the South-west and North-east Monsoons the channel is full, and the water very muddy, and as soon as this occurs, the species of fish begin to change, other sorts, such as the Notopterus, come down from higher situations, and as the intensity of the current augments, the smaller streams are flooded and the Carps either descend the river, until they are said, by Natives, to reach the Cauvery, or they ascend to streams as yet unaffected by the rains or

better suited for spawning and obtaining food,⁽¹⁾ Thus immediately the rains fill the Chennakennoor stream, Carp flock up to it from the Bowany, and every Native who possesses rod and line, commences angling; so common are they that a moderately expert hand can in a few hours obtain as many as two coolies can carry. Eels, Morruls, Koravahs, Vahlahs, Katurnas, and some other species do not appear to migrate, but seek protection from the current by getting behind rocks or beneath stones, thus effectually preventing their being captured by nets. Should some of the other species remain, they are said to be rapidly destroyed by the muddy, or as it is termed by the Natives, the *red water*. But this assertion is doubtful, although on one occasion the banks of the river for miles on each side were rendered most unpleasant, due to the presence of decomposing fish. In November 1865, a severe storm occurred, after which the banks of the Bowany for twenty miles above Mettapolliam were strewn with putrid fish, the inhabitants were greatly alarmed lest a pestilence should be the result. Whether the presence of mud in the water is the true solution of this mortality may well be questioned. It is true that in Malabar when the freshes join the sea water, numerous sea fish die; and trout also in Europe are frequently destroyed by the admixture of muddy water coming from manured fields, but did the mud alone destroy the fish here, they would hardly be found to ascend muddy streams to deposit their ova, and the Carp could scarcely live in the Bullicul lake, which is often exceedingly muddy. In fact, it is most probably only when the rains wash down the filth in large quantities from villages and localities in which cattle are numerous that the destruction of fish is thus caused.

The KULLAAR RIVER, close to the base of the Hills, below the Coonoor ghaut, is much smaller than the Bowany of which it is a tributary: as it brings down water from the Coonoor and Kotagherry side of the Hills, it is generally unaffected by the downpours of rain during the South-west Monsoon. Its bed and banks are similar to those of the Bowany, but on a smaller scale.

In the foregoing, I have endeavoured to give a short description of the pieces of water either on the Hills or at their

(1). On June, 22nd 1866, I found the Bowany half full of muddy water and no carps could be taken with a net, but the Kullaar river, which runs into it five miles nearer the Hills, was quite clear; and carps were still present.

bases, and the next question which arises is their temperature (for on this very much depends), as it must decide their adaptability for tropical sub-tropical, or temperate genera; and here it is necessary to make a short digression, in order to enter upon the climate of the Hills in general. Being situated between two Oceans they are exposed from June to September to the South-west Monsoon, and in October are again slightly affected by the North-east Monsoon, being placed near the line of demarcation of both. The question of elevation will be subsequently considered.

"The air during the months of January, February and March is intensely dry, the point of saturation, (or temperature to which the air must be reduced to deposit any part of its moisture) being occasionally as low as 13°, the temperature of the air being 60°. In April it begins to fluctuate, and in May the quantity of moisture increases very perceptibly, being accompanied by rapid changes in the electrical condition of the atmosphere indicated by thunderstorms, and heavy showers, but of short duration. During June, July, and August, it is nearly charged with moisture; in September, it is again fluctuating; in October and November, moist; and in December, it begins to re-assume its dry state," (*Baikie*, p. 76). The mean annual rainfall, according to the same authority, is 44° 88 inches.

Frosty weather begins about the end of December, and in January the nights are so cold that it frequently freezes in the valleys, but during the day the sun is very powerful, although a current of cold air commences in the morning, and lasts till about midday. In February the frosts become somewhat stronger; but in March the weather gets milder. In fact, after this month it becomes too warm for pisciculture, unless with species from warmer climates than that of England; whilst the Indian fresh water species require the Monsoon months.

It will be unnecessary here to say more than that by various calculations deduced from experiments, the temperature of the air is found gradually to decrease and become more rarefied the greater the elevation, and at elevations of not more than two miles 1° of Fahrenheit for every 300 feet, is considered about the correct calculation.

The question of the effects of the direct rays of the sun in the rarefied atmosphere of the Hills, is very important with

respect to its bearing on the water; fortunately there are certain disturbing elements, such as vegetation and wind, which scatter the heat: as well as others, which it would take too much space to enter upon here, where the question under discussion is merely a short synopsis of pisciculture on the Hills, and the probabilities of its success or failure. Grass and plants assist in dissipating the heat as far as the earth is concerned, but this is not observable in regard to water, and consequently obtains that the heat of stagnant, or nearly stagnant water such as the Lake at Ooty, is far greater than could "a priori" be supposed.

As to the success or failure of the acclimatization of fish, it must be observed, that although they may live, grow, and apparently thrive in certain localities, the great question is, whether they will breed? or if they do so, whether the young will degenerate? It is therefore of the greatest importance to ascertain correctly the heat of the water; but before entering into this subject, perhaps it will be advisable to give some remarks upon the temperature of the air at Ootacamund.

Thermometer in Ootacamund.*

Month.	Mean temperature.	Mean maximum.	Mean minimum.	Mean range between day and night.	Average.		
					6 A. M.	3 P. M.	9 P. M.
January	51	61	41	20	45	57	47
February	53	63	42	21	45	59	49
March	57	68	46	21	58	63	62
April	60	68	51	16	58	63	62
May	60	68	51	16	57	63	63
June	58	66	50	15	57	60	58
July	55	61	50	11	52	61	54
August	56	62	49	13	57	60	56
September	56	62	50	11	54	60	58
October	55	62	48	13	50	62	53
November	53	60	45	15	50	61	52
December	51	60	52	17	46	60	48

* NOTE.—Compiled, with the omission of fractions, from *Dr. Baikie's Account of the Neilgherries*—Observations on seven years, 1831-33 & 1853-55.—Appendix, pp. viii. and ix.

The following Table shews the greatest differences in the average of the monthly maximum and minimum, as observed by Dr. Baikie and Mr. Ross :—

Months.	Maximum.		Minimum.	
	Highest.	Lowest.	Highest.	Lowest.
January ...	67	57	44	39
February ...	69	60	45	38
March ...	72	62	50	43
April ...	73	64	53	50
May ...	76	61	53	49
June ...	73	60	52	47
July ...	65	59	53	48
August ...	67	58	51	47
September ...	65	60	53	48
October ...	67	59	49	46
November ...	66	58	46	43
December ...	63	56	43	42

The observations made in the Government Gardens at Ootacamund, during two years ending July 1866, again differ from those both of Dr. Baikie and Mr. Ross. The following facts have been collated from them :—

Months.	Dry bulb of Thermometer.		Difference in any one day.	
	Highest.	Lowest.	Greatest.	Least.
January ...	80	35	37	12
February ...	79	42	38	25
March ...	82	41	37	21
April ...	86	49	32	16
May ...	78	45	32	14
June ...	77	49	22	3
July ...	70	46	21	3
August ...	70	46	23	1
September ...	77	35	35	6
October ...	74	44	27	2
November ...	74	41	31	8
December ...	78	31	38	11

On comparing Dr. Baikie's and Mr. Ross' experiments with the results of the above, we find the mean yearly maximum given by Dr. Baikie to be 67°, that by Mr. Ross 61°

and at the Government Gardens 69°; whilst the yearly minimum given by Dr. Baikie averages 48°, by Mr. Ross 47°, and at the Gardens 49°. Dr. Baikie states that the mean temperature of Ooty is 56°, whilst the observations recorded in the Government Gardens, taking the mean maximum and minimum, places it at 59°. The following is from the Meteorological observations in respect to Greenwich, taken from the Government report for 1860 :—

Months.	Mean temperature.		Mean maximum.		Mean minimum.	
	Greenwich.	Ooty.	Greenwich.	Ooty.	Greenwich.	Ooty.
January...	39.9	57.5	45.0	71	34.8	44
February....	26.3	59.5	42.5	74	30.1	45
March.....	42.1	63	49.2	76	35.0	50
April.....	44.6	64	53.7	75	35.6	53
May.....	55.0	63.5	65.5	73	44.6	54
June.....	56.7	59	65.0	66	48.5	52
July.....	59.6	57	69.2	63	50.1	51
August.....	59.5	58	67.2	65	51.8	51
September...	54.6	58.7	63.4	68	45.8	49.50
October.....	51.5	59	58.6	68	44.5	50
November....	41.0	58	46.7	68	35.3	48
December....	36.3	57.5	40.6	70	32.0	45

From these figures it will be seen that, in January in London, the average maximum is about the same as the average minimum in the Government Gardens at Ooty; but in February it is about 3° warmer. In October, the maximum in England is 8° warmer than the minimum in Ooty; in November, the maximum is not 2° above the minimum in Ooty; and in December, the maximum in England is 5° warmer than the minimum in Ooty.

It will now be necessary to observe upon the temperature of the waters on the Hills, more extended observations are greatly needed, but the following is a synopsis of those made by myself, the majority being from the waters of the Ooty Lake, the heat of which is almost invariably greater than that of the surrounding atmosphere. Variations in temperature may depend upon several causes, such as the power of the sun's direct rays, which, as previously stated, are again influenced by many counteracting agents, as the force of the winds, the clouds, &c. It is also affected

by the amount of moisture in the atmosphere assisting or preventing evaporation. But taking a large series of observations, it appears probable that the heat of the water is very rarely below that of the surrounding air, although at certain periods, such as during the bursts of the monsoon, it sinks down nearly to a level with it. From this, we gain the following: that, given the heat out of doors, but in the shade, at Ooty, at any period of the year (winter?) that of the Lake will very rarely be found less, but occasionally greatly to exceed it, especially at mid-day. It appears to absorb and retain heat in the hot weather, and even during the burst of the monsoon; in a number of observations made while the cold winds were blowing, it was very rarely as low as the atmosphere. For comparison, a table of the heat of the water in various places on the Hills is given, taken at different hours, and dividing that before the burst of the monsoon on June 12th, from that subsequent to it from June 22nd. Running streams were, of course, colder than standing water.

Date.	Places.	6 A. M.		12 A. M.		4 P. M.		6 P. M.	
		Air.	Water.	Air.	Water.	Air.	Water.	Air.	Water.
From May 20th to June 12th, 1866.	Ooty Lake	57.50	67.50	71.77	70.79	61.73			
	Coonoor stream...	62.	60.	69.	72.	65.	67.		
	Half way down Ghaut	...	...	...	77.	74.	75.		
	Bowany river.....	77.	79.	96.	92.	91.	86.	82.	82.

Subsequent to the first burst of the monsoon, the following were the average of the observations noted:—

Date.	Places.	6 A. M.		12 A. M.		4 P. M.		6 P. M.	
		Air.	Water.	Air.	Water.	Air.	Water.	Air.	Water.
From June 22nd.	Ooty Lake.....	56.	57.	58.	64.	59.	68.	57.	65.
	Coonoor stream...	60.	61.	68.	70.	61.	68.	61.	65.
	Half way down Ghaut	...	...	...	...	65.	70.	...	...
	Bowany river.....	72.	70.	81.	79.	...	...	76.	78.

In a stream in the Government Gardens, in the middle of December 1866, Mr. Batecock was good enough to take seven observations with a maximum and minimum Thermometer. These he records as follows: average maximum, 72°; average minimum, 50°; highest point noted, 72°; lowest, 42°.

From the limited period at disposal for making these observations, my figures must not be received as exactly correct, but as a near approach to what exists. The Thermometer was always placed in the shade and in shallow water. This, of course, raised the temperature: but as fish ova are deposited in shallow water, the heat given is that to which the fish eggs would no doubt be subjected and which as will be subsequently shewn, will be too great it is to be feared, for fish from an English climate ever to thrive in. Prior to the burst of the south-west monsoon 15° was the greatest difference marked at mid-day between the water in the Ooty lake and that in the Bowany river. Subsequently, as the monsoon did not extend its range to Mettapolliam, it might have been anticipated that the difference would have been more marked, but such was not the case. During these cloudy days the temperature in the low country sank so much that the greatest difference between the water in these two localities at mid-day was only 14½°, although the elevation differs by about 6,600 feet. From the limited observations I was able to make, I was led to the belief that the proportionate heat of the water continue much the same. The Thermometer in the Bowany*, which at the latter end of May stood 92° at 12 A. M., was only 79° at the same hour on June 22nd. It is true that on the latter date there was a considerable amount of rain water from the Hills in the stream; but on the same day I examined the waters of the Kullaar river, which, although perfectly clear, shewed the same reduction in temperature. Therefore as a simple question of heat, it appears that the waters of the Neilgherries would be more suitable for low country fish than for those from Northern Europe; for, although the increased coldness of the water may retard the hatching of the fish, such will not weaken the fry, but has been observed in Europe to have exactly the contrary effect. On extending these observations to the Seegoor river, and the Chennakennoor stream, which are situated nearly, 2000 feet

* Placing a thermometer on a dry stone in the bed of the Bowany river at 6 P. M., on May 31st, it stood at 92°.

higher than the Bowany at Mettapolliam, but still are in the low country, I found the difference of temperature between these streams and the water of the Ooty lake to be only 7°; consequently, it may be assumed, other things being equally favorable, that fish from these localities would be best adapted for conveyance to the Hills.

The question of the temperature of the water is most material as regards the genera of fish introduced into it. To all appearances water may be well adapted for Trout, but too great heat alone will be sufficient to vitiate all other desirable points. The Salmon and Trout family, which partially or entirely pass their existence in fresh water, have no representatives either in the plains or the hill districts of India. In fact, if we turn to their geographical distribution, we find that the situations in which they thrive best, are pieces of water which are at least occasionally or partially fed from snow-clad lands, subject at certain or uncertain periods, to the influence of a temperature which falls below the freezing point, and where ice is sometimes perceived in the streams. Without asserting this to be necessary to their existence, or, perhaps I should say, to their propagation, still this coldness of the water appears to be necessary to their ultimate success.

In Australia, where Trout are now being introduced, the air is cold enough in the winter months for the water to freeze.* In the columns of "*The Land and the Water*," in reply to some inquiries made by me, as to the temperature considered necessary for Trout to thrive in, the following remarks appear:—"We may conclude that in the Trout streams of England at their sources, (being springs), the water rises at about 50°; but their temperature is subsequently affected and regulated by the seasons of the year and other conditions: and ranges, say from 30° to 70 degrees. I think 40 to 60 degrees the most favorable. I have found the eggs to do well at 30 degrees, the young fry thriving at 45 degrees; but in our rearing ponds at Sunbury, this last summer, I found the young fish doing remarkably well with the temperature of the water up to 70 degrees in the day time. There certainly was a sharp stream running. The mean temperature

* Dr. Lang gives 80°6 as the mean maximum of the air in the year in Queens-land, and the mean temperature as 61°1.

† S. Ponder, Esq.

"during the last fortnight (September) has been about 60 degrees; this day at noon it was 59 degrees"

From the foregoing, it appears more than probable, as in December the average minimum of the water in a running stream at Ootacamund was only 50 degrees, whilst the average maximum was as high as 72 degrees, that Trout can hardly be a success. By means of ice the temperature at this period may be lowered sufficiently to hatch and rear the ova. I shall, further on, shew that the fauna of the Neilgherries is almost exclusively tropical, and, therefore, it is scarcely probable that a species of fish from the colder region of England will succeed in their streams.

The fishes of the Hills, prior to the commencement of these experiments, may be divided into those indigenous and imported.* On the upper plateau of the Neilgherries there appears to be only one indigenous species, commonly called a Minnow (*Paradanio Neilgherriensis*—Day), which is to be found in the Ooty lake, the Pykara and Avalanche rivers, and the Kaity and Coonoor streams: it is a carnivorous Carp, belonging to a tropical fauna, and rarely exceeds 3½ inches in length. Once or twice a stray Eel (*Murena maculata*—Ham. Buch.) has been taken at Ooty; but as this species is often brought up alive for sale from the low country, it may reasonably be supposed that these solitary specimens may have escaped, especially as it is certainly not to be obtained by fishing in any of the pieces of water.

About ten miles below Kotagherry, on the Cleveland estate, at an elevation of about 3,500 feet above the level of the sea, there is a species of fish found known as the "Indian Trout" (*Barilius rugosus*—Day), which grows to about six inches in length. A little lower down, probably at about 3,000 feet, is a small Carp (*Puntius Grayii*—Day), and a little Loach (*Nemacheilus Guntheri*—Day), which is also found in the small stream between that locality and Kotagherry. Some others also exist close to the base of the Hills, in the various streams descending to the plains, but they are the same as those in the rivers of the low country, and can thus scarcely be included amongst the Hill fauna. In the Billicul lake are several species which have been imported, viz., a Carp* (*Puntius [Barbus] Carnaticus*—Jerdon), several of which have been captured, the largest

* Full descriptions were sent to the Zoological Society and published in their proceedings for March 14th, 1867.

weighing nearly 4 lbs., a female, and full of roe : in the rivers of the plains this species is said to attain to 25 lb. in weight ; a Loach (*Nemacheilus semi-armatus*—Day), which grows to six inches in length, and, although esteemed by the natives, is scarcely worth the trouble of carriage ; a paradanio (*Paradanio aurolineatus*—Day), which grows to about 5 inches in length ; and a very fine species of Minnow (*Rasbora Neilgherriensis*—Day), which is reputed to grow to eight inches in length, and breeds rapidly. These fish were all full of roe in April, and also at the end of June. They are said to breed in the north-east monsoon, as the south-west extends only very slightly to Billicul. My researches distinctly shewed, even had there not been so many fish present, that this elevation is well adapted for them ; that they obtain sufficient sustenance, and breed ; in short, that they have become thoroughly acclimatized on the Hills, although originally from the plains. But it must be observed that they were brought up from Seegoor, which is 1,900 feet higher than the Bowany at Mettapolliam, so that they were more inured to a colder temperature.

It will be as well to make a few remarks upon the rivers skirting the bases of the Neilgherry Hills, as regards their finny inhabitants, more especially the useful varieties.

In the Seegoor river I captured the same species as those in the Billicul lake, as well as the *Nemacheilus Denisonii* (Day) and the *Garra gotyla* (Ham. Buch.) and *Garra Jerdoni* (Day), which are abundant and grow to six inches in length ; but as they are adapted to running streams, they are very difficult to transport ; also, the spotted Trout of the Europeans (*Barilius rugosus*—Day), in reality a Carp, which is best adapted for living in rivers, although young specimens bear transporting pretty well, and the *Ophiocephalus gachua* (Ham. Buch.) Eels and some other species are said to be obtained there, but I could not procure them on a personal search.

In the Bowany, the varieties of fish are much greater, and there are some more valuable species. The following is a list of those I captured :—*Ophiocephalus Marulius* (Ham. Buch.)—Poo Verarl, Tamil ; *Ophiocephalus striatus* (Bloch.)—Curroopoo Verarl, Tamil ; *Ophiocephalus gachua* (Ham. Buch.)—Korava, Tamil ; *Mastacembelus armatus* (Lacep.)—Allaree, Tamil ; *Notopterus Pallasii* (Cuv. and Val.)—Ambutan Wahlah, Tamil ; *Hemibagrus punctatus* (Jerdon)

—Psetta Kullettee, Tamil ; *Hypselobagrus cavasius* (Ham. Buch.)—Vella Kullettee, Tamil ; *Wallago attu* (Bloch.)—Wahlah, Tamil ; *Wallago Malabarici* (Cuv. and Val.)—Chotah Wahlah, Tamil ; *Glyptosternum Lonali* (Sykes)—Kul Kullettee, Tamil ; *Nemacheilus Guntheri* (Day) ; *Nemacheilus Denisonii* (Day) ; *Garra gotyla* (Ham. Buch.) ; *Garra Jerdoni* (Day) ; *Labeo kontius* (Jerdon)—Currumunee Candee, Tamil ; *Labeo Dussumieri*, (Cuv. and Val.) ; *Labeobarbus tor*, (Ham. Buch.) ; *Puntius [Barbodes] gracilis* (Jerdon)—Coatee Candee, Tamil ; *Puntius dubius* (Day) ; *Puntius Carnaticus* (Jerdon)—Poaree or Saal Candee, Tamil ; *Puntius Grayii*, (Day), *Puntius filamentosus* (Cuv. and Val.)—Sawaal Candee, Tamil ; *Puntius arulius* (Jerdon) ; *Amblypharyngodon Jerdoni* (Day) ; *Rasbora woolaree* (Day)—Woolaree Candee, Tamil ; *Barilius rugosus* (Day)—Aart Candee, Tamil ; *Barilius [Pachystomus] cossa* (Ham. Buch.) ; *Paradanio aurolineatus* (Day)—Parrak Cunjoo Candee, Tamil ; *Paradanio elegans* (Day) ; *Esomus [nuria] Maderaspatensis* (Day) ; *Chela argentea* (Day)—Wellachee Candee, Tamil ; *Belone cancala* (Ham. Buch.)—Coco Meen, Tamil ; *Murena maculata* (Ham. Buch.)—Vellangoo, Tamil.

Amongst the foregoing, the striped or black Murrul—*Curroopoo Verarl*, Tamil—grows to about three feet in length, and is captured, not only in the sluggish parts of the river, but also in tanks and wells. It deposits its ova during the monsoon time, and is much esteemed for eating both by Europeans and Natives. The orange Murrul—*Poo Verarl*, Tamil—grows to about the same size as the last, but is only found in rivers, where it is said to get into holes in the banks. Owing to the Murrul having hollow heads, wherein they are able to retain water, they live a considerable time out of their native element ; but the orange Murrul does not bear transporting well, and is better adapted for stocking rivers than tanks. The small Murrul—*Korava*, Tamil—grows to about a foot in length, and is found both in rivers and tanks : it is easily distinguished from the young of the striped Murrul, by having a reddish orange margin to its tail, and back fins : it bears transporting better than any other of the same tribe. The spined Eel—*Allaree*, Tamil—grows to upwards of two feet in length, and is found both in the Bowany and in tanks : it is good eating, but rather rich. The spotted Katurna—*Psetta Kullettee*, Tamil—grows to about a foot and a half in length, and is fair eating. The silver Katuna—*Vella Kul-*

Ietee, Tamil—grows to the same size as the last. The Wahlah attains about $3\frac{1}{2}$ feet in length, and is good eating, although rather rich. The small Wahlah is equally good eating as the last, but only grows to about a foot in length. The common Eel—*Vellango*, Tamil—is found of a very large size, and is excellent eating. Amongst the Carps are several exceedingly fine species, especially the *Poo Meer Candee*, which attains a very large size in suitable localities, and the *Puntius [Barbus] Carnaticus* (Jerdon), which grows to about 25 lbs. in weight, and may be found in droves in the Seegoor, Chennakeunoor, and other streams when the freshes are down: they are esteemed good eating, but are rather bony.

The fish on the Hills (at least the only indigenous species) belongs to a distinctly tropical fauna, and to the carnivorous Carps. It may therefore be as well in this place to examine into the flora and fauna of the Hills, for the purpose of inquiring whether the tropical or temperate families predominate.

The Zoology of the vertebrate division of the animal kingdom has been better worked out than that of the invertebrate; still, much remains to be done by future inquirers, and many a gap needs filling up. The animals living in freedom in their native wilds will give us the best clue to the adaptability of the Hills to a tropical or temperate fauna.

The Mammals of the Neilgherries still remain to be thoroughly investigated by some future zoologist. Unfortunately, owing to my having been so suddenly ordered away, the collection I made has been greatly injured, and some of the specimens destroyed, as I had no time to take steps for properly securing them. The following therefore, only comprises a portion of those best known in the class Mammalia. In the order UNGULATA, family ELEPHANTIDÆ (Gray), the Elephant and wild Hog are found on the lower slopes, but have been gradually driven from, or destroyed by sportsmen on the upper plateau. Amongst the BOVIDÆ (Gray), the spotted Deer (*Axis maculata*—Gray), the barking Deer (*Cervulus moschatus*—De Blainv.), the Sambur (*Rusa equina*—Cuv.), the *Tetracerus quadricornis* (De Blainv.) and the so-called Ibex (*Capra*—?) are found. In the order GLIRES, and family FERROIDÆ (Gray), the small striped Squirrel (*Sciurus palmarum*,

Linn.) the *Sciurus sublineatus* (Waterhouse,) and the flying Squirrel (*Pteromys Petaurista*—Pallas sp.); in the LEPORIDÆ (Gray), the Hare, (*Lepus nigricollis*—Fr. Cuv.); in the HYSTRICIDÆ (Gray), the Porcupine, (*Hystrix leucura*—Sykes); in the MURIDÆ (Gray), several rats and mice, common also in the plains, are found. In the order FERÆ, and family FELIDÆ, the Tiger (*Felis tigris*—Linn.), the Cheetah (*Felis pardus*—Linn.), the Hyæna (*Hyæna striata*—Zimm.), the wild Dog (*Cuon primævus*—Hodgson), the Jackall (*Canis aureus*—Linn.), the Fox (*Vulpes Bengaliensis*—Shaw), the Mongoose (*Herpestes griseus*—Geoff.), and the *Herpestes Elliotii* (Gray), an Otter and a Bear (*Melursus tybicus*—Mayer); also a shrew Mouse, and the musk Rat. In the order PRIMATES, and family SIMIADÆ, is one Monkey (*Semnopithecus Johnii*—Fisch.); and amongst the VESPERTILIONIDÆ are several species of bats.

The foregoing are some of the most common and well known Mammals of the Hills, and on examining their general characteristics, we cannot but perceive that the tropical forms predominate; whilst, if we observe the members of the various genera, we see the little striped Squirrels of the plains most numerous, even as high as the summit of Kaity ghaut, where they also breed. In fact, the Sambur with its young are frequently found on the summit of the Hills, and even cubs of the Tiger and the Cheetah have been observed in that elevated region. It has, it is true, been stated, and apparently with reason, that in the colder regions they lose much of their ferocity, but no one has yet asserted that climate to be unsuited to their existence and propagation. In short, few, if any, mammals are obtained in the Neilgherries, that are not common to the plains surrounding their bases.

If we now turn to the Reptiles of India, we find the same general rule of the preponderance of a tropical Fauna, which obtains amongst the Mammals. The various divisions of the order CHELONIA are absent, except around quite the base of the hills, or the neck of the land connecting them with the Mysore territory; whilst the Crocodiles and Water Lizards appear to be totally absent, and the Land Lizards (*Lacertidæ*) are sparingly distributed. The *Acanthodactylus Neilgherriensis* (Jerdon) is recorded from Coonoor. Amongst the Skinks (*Scincidæ*), the black striped species, *Eumeces bilineatus* (Gray), is very common even on the summit of Elk Hill, overlooking Ooty, where it may be found under the

stones. Amongst the Geckos (*Geckotidae*) the *Gymnodactylus Indicus* (Gray); and in the *Agamidae*, the Flying Lizard (*Draco Dussumieri*—D. and B.) was obtained by P. Grant Esq., the Collector, a short distance below Coonoor, where he shot one out of three, which he found on a tree: he had previously obtained specimens in the same locality, and has one still preserved. The *Calotes nemoricola* (Jerdon) was also found at the foot of the Coonoor Ghaut, whilst the *Calotes nigrilabris* (Peters) is exceedingly common even on the summit of the Hills, especially in gardens and hedges; the *Salea Horsfieldii* (Gray) is also present, and the *Chamelecon vulgaris* (Daud) is by no means rare amongst the lower hill slopes.

In the order of snakes (OPHIDIA), the following have been recorded as captured on the Neilgherries.*

Sub order VIPERINE; CROTATIDÆ; TRIMESURUS:—*Trimesurus Malabaricus* (Jerdon), *Trimesurus strigatus* (Gray), *Trimesurus Wardii* (Jerdon). TRIGONOCEPHALUS: *Trigonocephalus Elliotti* (Jerdon).

Sub order COLUMBRIDÆ; RHABDOSOMA:—*Rhabdosoma microcephalum* (Gunther). CORONELLIDÆ: *Simotes Bizotatus* (Dum. and Bibr.). TROPIDONOTUS: *Tropidonotus stollatus* (Schleg.). COLUBRINÆ: *Cynophis Malabaricus* (Jerdon). DRYIOPHIDÆ: *Tropidococcyx Penotati* (Gunther). SILEYBURA: *Silybura Elliotti* (Gray), *Silybura Beddomei* (Gunther). ELAPSIDÆ: *Collophis concinnatus* (Beddome). UROPELTIDÆ: *Silybura ocellata* (Beddome), *Silybura brevis* (Gunther), *Silybura Neilgherriensis* (Beddome). PLECTRURUS: *Plecturus Perrotteti* (Gray), *Plecturus Guntheri* (Beddome).

Out of the foregoing seventeen snakes, recorded as occurring on the Neilgherries, five have been also captured on the Annamullays, and one of these in Ceylon, whilst another is common in the plains. Although the remainder are at present unknown, excepting in elevated localities, they are all distinctly tropical species, belonging to tropical genera.

Out of 118 species of birds, recorded by Jerdon,† either as residents on, or visitors to the Hills, or personally collected, 110 have been taken on the plains, or on lower ranges of hills, whilst 12 have been captured in Europe, although only half

* "The land and fresh water snakes of the Madras Presidency," by Captain Beddome—Madras Quarterly Journal of Medical Science.
† Birds of India.

of these were found in its northern latitudes. Seventeen of the above species have been observed unquestionably to nest on the Hills; and five, which are mostly winter visitants to India, have been known to breed in Northern Europe. There is only one, if it is the same species, the *Fulica atra*, which breeds in both climates.

Thus it appears that Avi Fauna of the Neilgherry Hills is mostly tropical, and although some sub-tropical forms are present, the existence of birds common to a temperate climate is very exceptional.

To enter fully into all the invertebrate animals found on the Hills, would be a work of great labor, covering a large amount of space, with hardly a commensurate advantage in the question of geographical distribution as bearing on pisciculture, but still the subject must not be dismissed without a few observations.

Amongst the COLEOPTERA some species are perhaps peculiar to the Hills, but the great majority are the same as those found on the plains, although they decrease in number as the ghauts are ascended, and some even ceasing at the base, as for instance the pretty but blistering *Myiabras cichorea*. The same may be said of the LEPIDOPTERA, with the exception that there is scarcely a species of Butterfly found on the Hills which is not also present on the plains. But it is very curious to observe the gradual decrease in number and species as one ascends the ghauts from Mettapolliam, where the variety is numerous, towards Coonoor. This decrease is first apparent in number, and then in species, many of which cease altogether at Coonoor, and others remaining, but gradually decreasing in number as Ooty is approached, where there are comparatively few. It may be safely asserted that the tropical species predominate amongst the Lepidoptera.

The Flora of the Hills is of an exceedingly varied description, an analysis of which would require a very extensive collection, and a great amount of study, the materials not being at hand from which a perfectly satisfactory conclusion can be drawn. A simple enumeration of families, genera, and species existing, would hardly give a true idea of its varied character. The lower slopes, of course, are distinctly tropical, as are also Coonoor, Billicul, and nearly as high as the Avalanche and Pykara, but above these elevations the sub-tropical forms commence. Individuals

of the same genera as found in the southern latitudes, Europe are common, although the species is generally different; but, notwithstanding, there is a deficiency distinct, pointing out that the climate differs from that of North Europe, or even England for instance. It may be that great variations of temperature which occur there between the summer and winter months are requisite to bring British trees to a state of high perfection; for example, I instance the Apple, Pear, Filbert, Gooseberry, Currant, and many other garden fruits which do not thrive at Ooty, whilst, amongst the flowering plants, such as the Geranium, Fuschia, Dahlia, and others, which it is necessary to keep indoors during the winter in England, this precaution is not requisite at Ooty, where they remain out with impunity during the cold season.

From the foregoing, I think we may fairly conclude that certainly the Fauna, if not the Flora also, is nearer to that of the tropical plains, than to that of a cold or even a temperate climate; that Mammals of the low country thrive and breed at the summit of the plateau; that the frogs of both localities are identical; that the snakes at the lower parts of the Hills are tropical, and at the summit, semi-tropical; that eminently tropical birds build their nests and rear their young at Ooty; and that insects of the plains are found almost as high as the summit of Hills. At the same time, it cannot but be evident that many of each of these divisions of the animal kingdom, which are common on the plains, are absent from the higher parts of the Hills. Indeed, as elevation is attained more and more species gradually disappear, whilst some new ones obtain; but even these, as a whole, (subject of course to some exceptions), belong to a tropical Fauna, or, if to a genus found in a temperate region, are usually also common to a tropical one.

Respecting the use of ice in retarding the hatching of fish eggs, Mr. Youl was good enough to invite me, on April 20th, 1864, to see two ice boxes opened, in one of which Salmon eggs had laid one hundred and forty-six days, and in the other ninety-three; some of the former were alive, whilst in the majority of the latter the eyes were even developed. Mr. Youl had some few years previously observed that as heat increased the rapidity of the hatching process, cold likewise retarded it without destroying the vitality of the eggs, provided it was not sufficiently intense to freeze them.

The ice employed should be quite pure; for, in the manufactured article, some of the chemical ingredients sometimes become mixed, and such would cause the death of the ova, for which reason American ice appeared best adapted for packing the ova in between Suez and Madras. It therefore made it an essential part of the experiment that such should be provided from Madras; for the expense of sending ice from England across to Suez, would I ascertained, be excessively heavy.

Much difficulty was experienced in obtaining permission from the proprietors of fisheries to collect Trout ova from their preserves, some had already promised it, others objected under the erroneous impression that injury would be caused thereby to the parent fish, whilst in a few places the spawning was over at the period when the eggs were required. Finally, having obtained leave from Melville Portal, Esq., of Laverstoke Park, near Micheldever, Hampshire, to take some Trout ova from the portion of the River Test, which runs through his estate, Frank Buckland, Esq., kindly consented to collect them. We proceeded accompanied by the keepers, Churchill and two Ballards, on January 18th, 1866, to the place where the fish were spawning. In the river flowing through the park and below Overton, we found sufficient ripe fish, from which we obtained about five or six thousand ova of a fine size, and either of an orange or of a yellowish white colour.

I may here refer to a previous attempt made to convey Trout ova to India in the "Ripon" in 1863, which failed. My information was derived from Mr. Shave, who went in

* The mode of collecting the ova was as follows: The male and female fish having been caught by means of a drag-net, first one of the latter sex was taken: one person steadied it by holding it firmly (without exercising too much pressure) by the tail just anterior to the caudal fin, whilst the operator grasped it round the shoulder with his left hand, and then with very gentle pressure compressed the abdomen by passing his right hand from its head to its tail, during which time the fish was slightly bent backwards. During this process a third person held a flat tin-pan, in which there was about an inch and a half of water, the abdomen of the fish just touched this, so that the ova were not exposed to the air, and, owing to the flat bottom of the pan, the eggs did not roll one above the other. Next, the male fish was taken and treated in the same way, and the milt flowing out discoloured the water, so that it appeared as if rice had been boiled in it. By gently agitating the tin-pan for a short time, the milt became amalgamated with the water; this was continued for about a minute, when some of the water was poured off, fresh added, and this was repeated until the whole was quite clear. The eggs were then placed in a tin-carrying can, care being taken neither to shake them, or expose them to the air.

charge. The number taken was about five hundred, and I have been informed that the eyes were developed before leaving Southampton. The development of the eye may be considered as ordinarily occurring about the thirty-fourth day after the egg has been removed from the parent fish, fourteen days subsequently to which the young generally hatch out; during this last period they bear vibration well, and their carriage from one place to another in Europe is usually effected. Mr. Shave, according to his instructions, daily took the ova on deck, and removed the dead ones. Most of them died before reaching Alexandria, but a few appeared to be alive on the Indian side of Suez, but these never reached so far as Ceylon. The rapid changes in temperature, which if this plan were adopted, would daily occur, would no doubt prove destructive to the vitality of the ova.

The ova which we had collected having been kept very cool all night, I started by the first train the next morning for Southampton, accompanied by one of the keepers. The tin can containing the ova was suspended to a stick, laid across from one seat of the railway carriage to the opposite. I took with me a hamper of fine moss collected from Lord Portsmouth's Park, and also a sack of charcoal; the small ova boxes had been previously sent on. At the P. and O. Stores at Southampton, I found that a refrigerator had been fitted up with ice, and we at once proceeded to pack the ova for carrying. I had eight boxes kindly furnished me by Mr. Youl, being identical with those he had had made for the Australian experiment; they were of inch pine; and $10\frac{1}{2}$ inches long, by $7\frac{1}{2}$ wide, and $4\frac{1}{2}$ deep, inside measure; the bottoms and covers being each perforated with about ten moderate sized holes, the lid screwing on. First a layer of charcoal was placed at the bottom of one of these small boxes, next a layer of moss and on that one of Trout eggs; then followed alternate layer of moss and Trout eggs, care being taken to avoid as much as possible, the ova touching each other, or any pressure being employed, for fear of either destroying the vitality of the eggs, or rendering the young fish cripples. The instrument made use of in moving them, was a curved hollow glass syphon, the upper end of which being closed by means of the thumb of the right hand, it was passed down close to the egg, when the thumb being raised from the top of the syphon, the egg was sucked up into it, and thus removed without any injury. To obviate too great and

sudden a fall of temperature, in passing from the water to the ice box, as well as to facilitate packing, all was done in water containing ice, and only of such a depth as to be just sufficient to cover the moss. Six boxes were treated in this way, and each box as packed, was placed inside the refrigerator, under ice.

On February 2nd, I removed the ova boxes from inside the refrigerator in the P. and O. stores at Southampton to on board the "Mongolia," where they were placed under the ice in the ice room. They took very little space, and there was no difficulty in placing them there. For the purpose of carrying them from the docks on board the Steamer, and also for conveying them across the desert, two cases were made of inch pine about three feet square: each of these I lined with a fine blanket, between which and the sides of the case a layer of cotton was inserted: outside were strong rope handles, by which it could be slung: whilst a tap was placed at the bottom to prevent any accumulation of water from the melting ice. To avoid the possibility of any interference with the cases, each was secured with a Chubb's patent padlock. The "Mongolia" left Southampton at 11-30 A.M. on February 4th, and very rough weather was experienced for the first two days. The run was as follows:—At midday, on February 5th, 130 miles; 6th, 220, weather rough, much rolling, and great vibration; 7th, 235, considerable rolling, vibration decreased, sea smooth; 8th, 275, sea smooth; 9th, 275, on which date we arrived at Gibraltar. On the 10th, 237, sea smooth; 11th, 295, quite smooth; 12th, 285, slight breeze; 13th, 160, smooth, anchored at Malta; on 14th, 264, sea smooth, and so continued the remainder of the distance; 15th, 292; 16th, 160, when we anchored at Alexandria. Owing to some mistake, one of the two large carrying cases was stowed away amongst the cargo, and as it could not be obtained for some hours, therefore I determined to remain on board until the next day, and take the ova boxes on shore myself in a small boat. This course I likewise thought would be preferable to going in the small tender, in which the vibration is frequently considerable.

I therefore landed and obtained the services of a Dragoman who promised to have a boat alongside the Steamer at 6 A.M. the following day, to enable me to be in time for the early train. The next morning one of the large cases was packed with ice, whilst the other contained the six ova boxes

with ice above and below them. They were gently lowered into the boat, and we pulled directly on shore, where, from the landing place to the station, each case was carried on a wooden pole between two fellahs; not anticipating any detention, I was surprised at being stopped by a Custom-House official, who wished to know the contents of the two cases into which he expressed a desire to look; but on the Dragoman using the magic word "bucksheesh," and giving some money, we were allowed to pass in safety to the Railway station. Here the Railway officials found that the cases were too large and heavy to be swung in any carriage in the train then starting, but offered to send them by the evening train, in which they hoped they might have a carriage when they could be suspended, but in which train they informed me I could not myself proceed, but must entrust the care of them to a native. Under these circumstances, and as if I agreed to this, it did not even appear certain that the cases could be slung. I was averse to leaving them with a man whose language I did not understand, and to whom consequently I could give no directions, and I therefore preferred adopting the alternative of taking them with me in the train unslung. The carriages travelled very smoothly to Cairo, where we arrived about 2 P.M., the distance from Alexandria being 162 miles. I left the ova boxes at the station to prevent the shaking they would have received. I had taken them into the town. On the morning of the 19th just previous to leaving by the 7 A.M. train, I opened the box, and found that the ice had only very slightly decreased; consequently I might with safety have employed much smaller outside cases, which would have contained sufficient ice to last the journey, and also have been easier to carry. Here, again, I was unable to get the boxes slung in the train. By the afternoon we reached Suez, distant from Cairo 90 miles, and embarked at 5-30 P.M. on board the steam ship "Bengal." In the Ice House of this steamer I found nine tons of American ice despatched by the Madras Government for the purpose of this experiment, and under some of this I placed the six ova boxes, the whole being well covered over with blankets.

At Suez I considered it very advisable to examine one of the ova boxes, to ascertain what the mortality had been, especially as the cases had been unslung in the railway journey across the Isthmus, a distance of 252 miles. I therefore opened one of them, and out of the whole of the upper

layer did not perceive above five per cent. of dead ova, which I considered to be so far most satisfactory, clearly demonstrating that slinging in the railway train is not indispensable at least after the ova have been a fortnight in ice.

On February 19th, at 6-30 P.M., we weighed, and had very smooth weather all the way to Madras. The vibration on board the "Bengal" was exceedingly great, almost equalling that of a railway train. Owing to the heat of the weather, I found it necessary to see that the boxes were well covered with ice, at least every alternate day. The run was as follows:—

February 20th, 185 miles; 21st, 234; 22nd, 232; 23rd, 221; 24th, 171; 25th, 167, when we anchored at Aden at 11-40 P.M. On Monday 26th, weighed at 10-15 A.M.; on 27th, 195 miles; 28th, 220; March 1st, 210; 2nd, 199; 3rd, 208; 4th, 216; 5th, 230; 6th, 207; 7th, 210; 8th, 213; arrived at Galle at 4-25 P.M. On March 9th, we left Galle at 6 P.M.; 10th, 150; 11th, 233; 12th arrived at Madras at 6 A.M. Soon after anchoring Captain Crowther, the Deputy Master Attendant, came on board, and when the small ova boxes had been packed in ice, inside the large carrying cases, he took them on shore to the Master Attendant's office.

Every assistance was received from the various officials in the P. and O. steamers to facilitate the safe conveyance of the Trout ova, but the person who was especially concerned was the butcher, as he has charge of the meat and vegetables in the ice room, and unless he had been careful, the droppings from the meat might have fallen upon the ova boxes. But any chance of such a catastrophe is more to be feared theoretically than practically; what is most to be dreaded is, that the boxes will not be properly packed at first starting, especially at Suez, for at the commencement of a voyage every one is exceedingly busy; but if this is efficiently done, very little care is requisite to ensure their being well conveyed, especially as blankets are placed over the ice that covers them: in fact from Southampton the ice lasts as far as Alexandria, without fresh being required. In the tropical seas it is necessary that they should be personally inspected at least every alternate day, and a little more care in stowing them is requisite, first that they should not too near the sides of the ice room, and secondly that there should be plenty of blankets over the ice in which they are embedded.

On landing at Madras, the large case which contained the ova was slung in a strong wooden frame, which Mr. Franklin, the Master Attendant, had made at his Office, and which could be placed inside a railway baggage carriage, thus completely preventing all vibration. But as I had experienced so much difficulty in the carriage of the two large cases, with the ova boxes and ice inside, across the Isthmus of Suez, I felt certain that coolies would not carry them up the ghaut from Mettapolliam to Coonoor, and therefore suggested that smaller ones should be made of the following dimensions, 22 by 21 inches, and 16 inches high. Even these as it subsequently turned out, were larger than was absolutely necessary. They were each lined with a blanket, and had rope handles, so that they could be slung in a palanquin. On the morning of the 13th I placed a sufficient supply of ice in the larger cases containing the ova boxes to last to Coimbatore, and in the other box I packed a further supply, in case it might be required. I left Madras at 5 P. M. on that day by rail, and proceeded direct to Coimbatore, arriving at midday on the 14th; for, although the day train takes a shorter time in completing the journey, the cool night air seemed most favourable for the conveyance of ova in ice. The large case containing the ova boxes, and slung in its framework, was placed inside a baggage van, which the Railway authorities permitted to go on direct to Coimbatore, so as to avoid any moving. At Coimbatore the sun was so powerful, that instead of continuing my journey at once, I decided on remaining until 4-30 P. M.

At the railway station I removed the six ova boxes from the large carrying case, and divided them amongst the two smaller ones, which had been made in Madras. Each was slung by ropes inside a palanquin, and also covered over with a wet blanket. Having a large English blanket remaining, I soaked it in water, and covered over one of the palanquins with it; the other palanquin was covered with blue serge, which was also kept moist. The Tahsildar of Coimbatore, Govindoorajooloo, accompanied me as far as Mettapolliam, twenty-six miles, and rendered me every assistance on the road; we arrived at 1 A. M. at the bungalow, and at 2-30 A. M. on the 15th, as soon as the coolies were ready and everything in order, we left again, accompanied by the Tahsildar, and ascended the ghaut, arriving at Coonoor (15 miles distant) at 9 A. M. After remaining an hour we left for Ootacamund, twelve miles distant. We reached the

Government Gardens at 4 P. M. Care was taken to convey the palanquins with as little shaking as possible, and as the ova boxes were slung inside, they could not have suffered much, whilst the wet blanket on the boxes, and also the wet covering over the palanquins, effectually kept the outside of the boxes moderately cool. On arriving at the Government Gardens I went direct to the fish-house, accompanied by Mr. McIvor, the Superintendent, and his Assistant, Mr. Batcock, who both then and subsequently rendered me every assistance, and cordially co-operated with me in carrying out my wishes.

The fish-house was made of brick, with a solid six-foot stone foundation and a roof of corrugated zinc, situated above the Government Gardens, and about 100 yards below the gate of the Dodabetta Cinchona plantation, facing E. S. E., and divided by the road from a ravine, which runs directly downwards towards the great basin of Ootacamund. Its back was towards a bank, from which stone and gravel had been removed, and at its upper gable end was the stream which fed the troughs inside. The length of the building (inside measure) was nineteen feet nine inches, its width eleven feet; its height to the top of the wall seven feet five inches, and at its gable end two feet higher. Its walls had five rows of orifices, formed by the omission of every alternate brick in the row. At the upper end was a double glazed window, which opened 44½ inches wide, and was sixty-seven inches high, whilst at its lower end there was a single window, 29½ inches wide, by forty-six inches high. The door which faced the ravine was six feet two inches high, and thirty inches wide, it was glazed in its upper thirty-four inches. The floor, except for three feet of its width, was formed into two large tanks, separated by a solid low stone wall, into this the water from the ova boxes flowed; it was intended for the reception of the young fish. The slate ova troughs were placed in the upper corner of the building, one above the other like steps in a ladder, the lowest being just in advance of the one above; they were laid in a brick foundation, the leaden pipes from one leading the water directly into the one beneath and anterior to it. Their size (inside measure) was 36½ inches long, by seven inches wide, and four inches deep, with a small leaden pipe fixed into the front of each near one extremity, and about one inch from the summit, with a piece of perforated zinc behind it to guard against the eggs being washed down it by

the flow of the water, whilst each trough had a deal cover. The troughs were already in their places, and had some fine-pounded granitic stone in them forming gravel, which had been dug out of the solid rock behind the fish-house. This gravelly bottom was placed to prevent the eggs from rolling about, whilst the shallow water allowed sufficient oxygenation, and the constantly flowing stream rendered it as pure as was possible. The covers kept it dark, such being unfavourable to vegetation and deposit on the ova, and on the other hand being favourable for hatching fish eggs.

As it was rather late on arrival, viz., 4 P.M., time only permitted the unpacking of one of the large boxes containing three ova boxes. The ova looked very well, at least one thousand and five hundred being alive. As the temperature of the water stood at 55° I placed some ice in it, and in this I put the eggs as removed from the boxes. The number of live ova were sufficient to fill the three slate troughs, only about ten per cent. being dead. The next day I found that the temperature of the water was 51° in the early morning, 69° at midday, and 61° at 4 P. M. I left the unpacking of the second box until the evening of the 16th, when I completed it in the same manner as in the first box. The mortality was nearly twice as great as amongst those first unpacked, which I cannot account for, except that they appeared to have been shaken, and that they were from the box which was conveyed in the palanquin with the serge cover, which probably did not so effectually keep off the sun as did the blanket. These ova were placed in two large teak troughs, which Mr. McIvor had had made for me, there not being sufficient room in the slate troughs to contain them all comfortably.

The water which was employed for the experiment, flowed down in a small pure stream from the Dodabet plantation, directly through the fish-house, the exposed length being about 100 yards from the gate of the wood to the fish-house. The temperature of the air and water are as already observed great considerations in such an experiment as this, for much depends upon that of the latter. "The proper temperature of the water, both in and out of doors, ought to range from 40° to 45°, for anything above 50° is weakening" (*Buckland on Pisciculture*.) The first thing that struck me on arrival, was, that, although it was past 4 P.M., the water inside the fish-house stood at 55°, a temperature, appa-

rently, too high for success. On the following day I found that early in the morning the water stood at 51°, at midday 69°, and at 4 P.M. 61°. From a series of observations taken at different periods of the day, I found in the month of March the temperature of the water in the slate troughs to average as follows:—

7 A. M. 12 A. M. 4 P. M.

Water, temperature ... 51° ... 66½ ... 59°

The heat of the water rose one day at 12 A. M. to 71° in the fish-house, the lowest it stood at, at that hour of the day, being 60°. In the stream the usual temperature at midday was 72°; on the 22nd of the month it was a cloudy day, threatening rain, and the temperature of the water at midday was 66°, of the air in the fish-house 62°, shewing that the water was 4° warmer than the air. In the month of April there was not much alteration in the temperature.

I here insert the daily readings of the dry bulb of the thermometer, as taken in the Government Gardens:—

Months.	Dry bulb of Thermometer.			Daily Variation.	
	7 P. M.	2 P. M.	6 P. M.	Maximum.	Minimum.
March 15th ...	...	...	58	...	...
" 16th ...	56	73	61	78	55
" 17th ...	59	74	62	77	53
" 18th ...	61	76	64	77	53
" 19th ...	54	74	70	77	52
" 20th ...	59	...	61	79	56
" 21st ...	60	77	64	80	55
" 22nd ...	61	73	63	80	57
" 23rd ...	60	77	60	80	56
" 24th ...	59	77	64	79	55
" 25th ...	60	79	64	82	55
" 26th ...	56	75	68	78	51
" 27th ...	57	70	64	78	55
" 28th ...	57	75	62	80	57
" 29th ...	61	78	62	80	56
" 30th ...	57	68	60	78	54
" 31st ...	54	...	60	78	49

Months.		Dry bulb of Thermometer.			Daily Variation.	
		7 P. M.	2 P. M.	6 P. M.	Maximum.	Minimum.
April	1st ...	57	66	60	77	49
"	2nd ...	56	71	62	75	55
"	3rd ...	55	58	57	77	53
"	4th ...	58	...	60	72	55
"	5th ...	56	...	...	75	55
"	6th ...	55	75	61	76	51
"	7th ...	55	79	63	80	51
"	8th ...	63	72	64	77	56
"	9th ...	61	74	64	79	59
"	10th ...	60	75	65	80	58
"	11th ...	59	77	...	...	54
"	12th ...	...	...	...	...	...
"	13th ...	...	75	65	81	...
"	14th ...	57	74	61	77	57
"	15th ...	61	74	63	79	55
"	16th ...	56	75	64	78	56
"	17th ...	57	69	63	77	56
"	18th ...	55	71	60	70	54
"	19th ...	57	71	57	77	53
"	20th ...	56	76	63	86	54
"	21st ...	58	70	60	75	56
"	22nd ...	60	...	57	75	53
"	23rd ...	59	69	62	75	53
"	24th ...	58	64	55	71	55
"	25th ...	58	61	60	73	53
"	26th ...	56	72	59	79	56
"	27th ...	57	74	61	75	54
"	28th ...	59	75	...	77	55
"	29th ...	60	78	57	78	54
"	30th ...	57	71	56	75	56
May	1st ...	56	65	58	72	54
"	2nd ...	56	67	...	70	54

In Australia, where this experiment has proved very successful, it was undertaken at the same period of the year as the one in India, but going from a northern to a south-

ern hemisphere, the Ova reached their destination at the beginning of the cold season; but in India on the contrary, in the commencement of the hottest months.

Finding that the sudden change from the ice box, in which the temperature stood at about 40°, to the water where it reached about 70° was rapidly causing the destruction of the Ova, I attempted to cool the stream by covering it over with bushes for 100 yards. This reduced the temperature 3° or 4°, sometimes as much as 5°, but as the bushes withered, the leaves fell, into the water. The stream was then covered over with large plates of corrugated zinc and wooden boards, upon which the bushes were placed. Subsequently a loose brick drain was put in, and covered over with bricks, above which were the zinc and boards, with the bushes above all. The roof of the fish-house was also covered with mats.

The water looked beautifully clear, but in reality it deposited a fine sediment of red sand, and some vegetable matter also appeared to be carried in solution, probably derived from the decomposition of the leaves of the trees in the Cinchona plantation, through which it flowed. As I had no English filters, I employed the first third of the upper slate trough as a filter, by placing pieces of perforated zinc across it, and raising fine sand barriers, through each of which the water had to pass. A fine sand filter was also placed at the entrance of the pipes leading to the slate troughs. In the boxes having no slate tiles, panes of glass were laid over large walnut-sized pieces of gravel, but they did not seem to collect much of the deposit. The wooden covers were kept over the slate troughs, and the windows also were darkened by mats. In spite of all these precautions, and increasing the stream of water, some of the fine red sand managed to pass through, and attached itself to the eggs. On examining the stream at its edges, there were some appearances of vegetable deposit; so obtaining a number of loose bricks that had never been used, a drain was made for 100 yards in the following manner; one brick was laid for its bottom, one on either side, and one covering it in at the top. Of course no mortar, chunam, or cement was employed in laying the bricks, they were merely put loosely into the stream, to form a clean channel. At ten different places this channel was crossed by pieces of perforated zinc, each of which had a sand filter posterior to it. This effectually

prevented any foreign substance from being carried down, but still this did not altogether keep out the sand. On and after March 30th, distant thunderstorms commenced, the weather became more cloudy, and the water dirty, whilst insects managed to find their way into the troughs. On the night of April 1st as many as 200 of the Ova died, due either to the insects, or to the deleterious state of the water, or both: whilst at the same time, it does not seem improbable that the electric disturbance might also have acted injuriously.

On opening the small Ova boxes, on first arrival at Ooty, the following were the appearances of the eggs. The dead ones were of an opaque white colour, and some of them adhered to the moss, but this was by no means the rule. The living eggs were clear, some with a slightly lighter margin, others with a few vessels apparently converging towards one spot in the interior of the egg. A few of the eggs were of a clearish flesh colour, and these I had reason to believe were being affected by the change of temperature, for they soon afterwards died. The mortality for the first seven days, as might have been anticipated, was very great, evidently due to the change of temperature, from the ice boxes to the water; then it decreased and the eggs became cleaner. On March 23rd, the eighth day, a dark spot began to be distinctly visible in the centre of the eggs, but the eyes were not apparent. The Ova at this time were doing best in the lowest trough, where the deposit of sand was also the least. On March 29th, the eyes were first apparent, in some of the eggs of the first batch which were unpacked, but in the majority the eggs did not advance from this time as they should have done, although in a few the form of the rolled up embryo became apparent. But on the night of April 1st a great mortality commenced, which continued until the death of the last Ova, on April 10th. It began as follows: after a thunderstorm leeches commenced moving about in the jungles, and a very fine species, some of which were hardly thicker than horse hair, and about half an inch in length, suddenly invaded the troughs, passing through the filters. They seemed to make a bite in the eggs, thus destroying their vitality, and to have sucked out the juices. At this spot, a white fungoid growth subsequently appeared, being the decomposed interior of the Ova starting out through the injured walls. A second species of insect, which seemed to do damage to the eggs, was subsequently detected.

To preclude the possibility of its being stated at a future time, that I gave up the experiment before the full period had arrived at which the Ova might hatch, namely, fifty-days, I placed about 100 living eggs under fine sand in the troughs, where I left them until May 2nd, when I found them, as I anticipated, to be dead.

Should a second experiment be desired, which I cannot recommend, unless fish from the south of Europe are selected, I would suggest that the period of year chosen has not been that best adapted for success, but it was only in the months of January and February that leave could be obtained from the P. and O. Company to try the experiment in their Steamer. This brought the Ova to the Hills in the beginning of the warm weather, when the water was too hot for the purpose. The latest period for leaving England should be at the end of October, or beginning of November, when Trout Ova might be obtained. "The Thames Trout have all completed their spawning operations by the end of November."*

If Ova left England in the beginning of November, they would arrive at Ooty in the cold season, when thunderstorms and even showers are absent, so the onslaught of water vermin need not be feared. The trouble of bringing out Ova overland is not great; the small Ova boxes having been properly packed under the ice at Southampton, should not require even to be looked at before reaching Alexandria. For going on shore and crossing the desert, smaller boxes than I employed should be used; in fact, rather less than those in which the Ova boxes were carried up the ghaut to Ooty. In the train it is certainly advisable, but not indispensable, that boxes should be slung. At Madras, and along the route, nothing could be better than the precautions taken by Government to ensure success in the experiment.

At the fish-house I would suggest some alterations. In the stream, there should be a brick reservoir made near the gate of the Cinchona plantation, 100 yards above the fish-house, and a second one inside the fish-house, in the form of tubs; whilst from the first reservoir to that inside the fish-house a leaden pipe of two inches in diameter, guarded by a stop cock at both ends, should be laid along the brick water-course, and down this pipe, all water going from one reservoir to another, should be conveyed. These

* Frank Buckland, "Land and Water," page 77.

tubs should contain sufficient water to last twelve hours, so that it should only flow in during the night, that for the day time being supplied from the tubs, wherein it would continue cool; from these, two pipes also furnished with stop cocks should lead the water to the top of two English filters. The water having passed through the filters should fall into the upper of a series of cooling chatties nearly filled with sand and charcoal, and the water from the lowest should fall down direct to the upper of the slate Ova troughs. For this purpose, the lower tank in the fish-house would have to be deepened, and the Ova trough placed four feet or more below the present level of the ground: but as there is a six-foot foundation, this can easily be accomplished. Of course, the stream, and especially the reservoir out of doors, should be kept well covered over, and the brick drain be continued, as it is now, for about 200 yards higher up the plantation. If some Australian or other trees could be planted to shade the fish-house, it would also be better; otherwise the roof should be thatched. The apparatus should be kept in full working order for at least a month, previous to the expected arrival of the Ova: a shorter period would be insufficient to ensure its correct working.

But, as I have already stated, I believe the waters of the Neilgherry Hills are too hot for the residence of Trout, which have been originally obtained from Northern Europe. It appears more probable that some of the species of Charr from Southern Europe would succeed in its lakes and streams. The whole experiment has been detailed in full, in order to be of assistance to future enquirers, should it be desired in after years to stock the waters of the Neilgherries with European species of fish.

When the Trout experiment was failing, being aware that, even if it were subsequently re-tried it could only be after the lapse of some time, I considered it very undesirable to leave the Hills without another effort to stock the waters with fish. Therefore, on April 16th, I addressed an official letter to the Collector of Coimbatore, suggesting their importation from the plains, as the upper end of the lake appeared to be admirably adapted for Eels and Murrul, and the lower for Carp, the only doubt being whether the water was too cold, which I did not believe it to be. Of course, only time could prove whether fish thus transported would thrive, and breed without deterioration. The Pykara River

will, no doubt, do excellently for large Carp and Murrul. I had previously tested the possibility of bringing them up alive to Ooty from the plains, and either alone, or with the assistance of Mr. Batcock, of the Government Gardens, had succeeded in importing upwards of a hundred fish from the Billicul Lake, and the Seegoor and Pykara rivers, with comparatively small loss. I found that the Rasboras and Paradanios carried well, as also the large Carp, provided they could be kept alive until the evening.

The presence of Carp, weighing as much as 5 lbs., in the Billicul Lake, was conclusive evidence of their thriving in that locality; and as there were Ova inside the females, there was reason to suppose that there were young ones in the same piece of water, which by the great increase amongst the Rasboras and Paradanios, proved that there was nothing in the water deleterious to the breeding of fish. Why no young Carp could be found was a mystery, but it appeared to me that the absence of any grass or weeds round the lake or pond rendered breeding impossible. But that fish will not breed in some pieces of water has been seen elsewhere; for instance, in Lady Rodney's pond at Alresford, in Hampshire, Carp grow to an enormous size, but, though Ova are found in them, they never breed.

I have shewn that the Billicul Lake is suited to the residence, acclimatization, sustenance, and increase of fish originally introduced from the plains, and as no attempt had up to this time been made of a similar nature, either at Ooty or Pykara, to prove the contrary, it was reasonable to suppose that these pieces of water might be equally well adapted for the finny tribes. About this time, Mr. Burnett, of the Wynaad, was good enough to present me with a collection of fishes from his estate there, situated 3000 feet above the level of the sea; and amongst these specimens I found a young Murrul—*Curroopoo Verarl*, Tamil—(*Ophiocephalus striatus*—Bloch.), which convinced me that this species would live and breed in elevated localities. In the north of India it is seen at Dharwar, and other parts nearly of the same height.

I must again refer to the geographical distribution of the following seven species of fish, which I hoped to have been able successfully to introduce on to the Hills, besides the Common Eel.

	Billicul, about 5700 feet eleva- tion.	Seegoor, about 2900 feet eleva- tion.	Bowany, 1000 feet elevation.
<i>Ophiocephalus marulius</i> ...			Present.
„ <i>striatus</i> ...			„
„ <i>gachua</i> ...		Present.	„
<i>Labeobarbus tor</i> ...		Absent.	„
<i>Puntius Carnaticus</i> ...	Present.	Present.	„
<i>Paradanio aurolineatus</i> ...	„	„	„
<i>Rasbora Neilgherriensis</i> ...	„	„	„

Those found thriving at the highest elevations appeared best adapted for transporting to the upper plateau of the Hills. At the same time it did not appear indispensable that they should be obtained from the highest level.

The *Ophiocephalus gachua* (Ham. Buch.)—*Korava*, Tamil, grows to, at least, one foot in length, and from 1 to 2 lbs. in weight. It is esteemed as excellent eating, and appears to be one of the species best adapted for transporting from place to place, as it lives in the hottest districts as well as in deep and cold wells. Sunshine and shade, heat and cold, seem almost immaterial to its existence and propagation, although they affect the size to which it grows. It can be easily transported either in hot or cold weather. Thus one day when I was bringing nine of them from Coonoorto Ooty, in a chatty of water, they experienced a change of 21° in temperature, without apparently producing any deleterious effects. Another time, at Cullhatty, on July 19th, 1866, a coolly turned one of them accidentally out of a tin-can of water; this occurred at 5-55 p. m., when the temperature of the air was 69°, and was not discovered until 8-45 p. m., or about three hours subsequently, when the fish was found on the gravel walk outside the Bungalow perfectly well and uninjured. Two days later it was turned into the Ooty Lake. I afterwards was able to try a still more interesting experiment proving the strong vitality of this species. On July 25th, I was going from Wellington to Mettapolliam, and on passing the Kullaar bridge, found it under repair, and a master-carpenter with several natives at work there. As, at a former period, I had vainly endeavoured to obtain some of the little fish I saw swimming about in the stream, I

offered the Maistry an anna for every sort of fish he could capture before 4-45 p. m., when I expected to return. Amongst those he procured, was a young *Ophiocephalus gachua*; but having nothing in which to carry it, I moistened my handkerchief in the river, and rolled him up in it, leaving his head uncovered. An hour subsequently, I put him into a small stream of water by the side of the road; he gave three gasps and was as well as ever. At 6-45, I repeated the dipping, and at 8-45, on my arrival at Wellington, he was quite well. The next day, he was placed in the Coonoor stock pond, and on August 2nd, removed with 14 others into the Ooty Lake. Vitality must be great in a fish which will bear an ascent of nearly 5000 feet, carried in a wet pocket handkerchief, which was only moistened twice during the journey, which occupied four hours.

One of the greatest difficulties during the progress of this experiment, was in obtaining the fish; for, although the Collector gave every assistance in his power, and directed the Sub-Magistrate of Mettapolliam to assist me in my operations, I found the latter most apathetic and indifferent: constant excuses were forwarded instead of the fish, and the same common native tale was told me at all times, whether I was present or elsewhere, viz., that the water was unsuitable; but that after a few weeks or months it would be just right, or, at other times, the proper sorts of fish were absent; sometimes muddy water was requisite, or when that was present, none could be captured until it was clearer! At a later date, about the end of July, when young fish of a proper size became plentiful, having ascertained by experience the best methods of conveying them, I was in the position to be able to make a contract with a native at Mettapolliam, which I found very successful, being cheaper in the end, and greatly expediting my efforts. The agreement entered into was that I should pay eight annas a head for every fish taken by myself alive out of the Coonoor stock pond; whereas I found that those collected personally varied from a Rupee four Annas each, and upwards. The captures immediately increased, and in a week twenty-five *Ophiocephalus gachua*, and two *Ophiocephalus marulius*, with several Carps, were safely removed from Coonoor, and the experiment assumed a different aspect. But subsequently the contracting Native went to Coimbatore, leaving another party to carry out the arrangement, and the fish sent up again decreased in number. Another agreement into which I entered with an East

Indian at Seegoor, for bringing up Carp, was not so successful. I offered four annas a head for them delivered alive in Ooty, but not receiving any, was obliged to increase it to six annas. His employer had previously tried the experiment, and sent me up six large Carp at the cost of one Rupee.

Young fish are the best to transport, as they travel more safely, and do not knock themselves about so much in the transit—therefore, are not so much exhausted, and fewer die; but as fish breed in the monsoon time, the young are scarcely ready for removal before the end of July or beginning of August, when they abound in the Bowany. But if the species breed in October, such as the Rasboras at Billicul, the young are best taken at the end of that month, or beginning of November; but as these months are very cold on the Hills, it would be unadvisable to choose this period for the experiment. March, April, and May are said to be good months for obtaining fine young fish for conveying to the Hills. The most desirable period of the year could not be chosen in this instance, as the experiment was only sanctioned in May, and was commenced on May 23rd, when I left Ooty and reached Mettapolliam on the Bowany River the same evening. The season best adapted for these experiments appears to be between the bursts of the monsoon, for reasons which will be subsequently detailed.

The geographical distribution of the species of fish found on the Neilgheries, in the adjacent low country, and in the intermediate elevations, claimed my particular attention, as much information may be gleaned from this, respecting which species will be likely to thrive best at the highest elevations, and feel the change of climate least. Thus amongst the *Puntius* genus there exists in the Bowany, 1000 feet above the level of the sea, the *Puntius Carnaticus* (Jerdon), *Puntius Grayii* (Day), *Puntius arulius* (Jerdon), *Puntius flamentosus* (Cuv. and Val.); but out of these four, only the first is found in its natural wild state at Seegoor, 2900 feet above the level of the sea, and it had been imported to Billicul about 5700 feet above the sea. This species, which attains 25 lbs. in weight, appeared best adapted for trial.

At the time the experiment was commenced, there were five species of low country fish acclimatized on the Hills, and one indigenous species; the others had been imported from the Seegoor stream. Five out of these six species never exceeded six inches in length, the *Puntius Carnaticus* alone

growing to a large size. A few miles from Kotagherry, but at about the same elevation as Seegoor, four species were found: one *Barilius*, an Indian Trout, the same as found at Mettapolliam and Seegoor; one *Nemacheilus*, the same as found at Mettapolliam; a *Puntius*, which is common in the same place; and one species differing from any in the plains. But none of these were worth transporting to the upper plateau, their size being so insignificant.

The varieties of fish in the Bowany and Seegoor rivers worth transporting have been detailed; it now remains to observe upon the best method of carriage. It must be remembered that the higher the elevation from which they are brought, the more probability will there be of their thriving on the upper plateau; consequently, those from Seegoor 2900 feet above the sea, are better adapted for acclimatization than those taken from Mettapolliam 1900 feet lower; although the species may be identical. However, in this case, it must not be forgotten that the Seegoor River eventually finds its way into the Bowany, and that during floods, some species of fish from the latter stream frequently migrate up their tributaries; consequently, a fish at Mettapolliam one day, may in the course of a few days, be found at Seegoor. Some species however, do not appear to migrate thus, and these were not deemed suited for this experiment.

The best time of day for capturing fish depends greatly on the mode employed, the locality, and the season of the year. On the Hills, the middle of the day seems to be the best for netting; whereas in the plains, this period is too hot (unless in cloudy or rainy weather), and the mornings and evenings are preferable. During the first burst of the south-west monsoon, very cold winds commence at night time, and continue until about 10 or 12 in the day; this renders the water in the chatties intensely cold, and causes the death of fish thus conveyed. Fish caught by a hook are always liable to injury; consequently, those taken in a net are best adapted for stocking other pieces of water. Eels are captured either in baskets at night time, or by hooks; in either case great care should be always taken in releasing the fish, as fatal injuries are often inflicted by carelessness at this

* Excepting Eels.

time. The fish*, as they are captured, should be placed in earthen chatties, two-thirds full of water, with grass floating on the top, and wrapped round outside with wet leaves or grass,

which is certainly a great desideratum, although whether it assists in the elimination of oxygen from the air, or simply by affording shade, is questionable. The chatty should be placed in a moist tub, until sufficient fish have been obtained; or, if this be not available, a small net may be tied over each chatty, when they may be put into a shady part of the river or pond.

The time of year best adapted for introducing fish could not be ascertained with certainty at the commencement of the experiment, as the seasons at which they breed were unknown. Neither the Carps, the *Ophiocephalidae* or the *Bagridae* can be introduced by means of their Ova. The principal season for depositing Ova in this portion of India appears to be during the south-west monsoon on the western side, and the north-east monsoon on the eastern. Owing to this, the eggs are deposited at a time when the greatest rush of water occurs; but in consequence of the stringiness of the Ova, and their being attached to grass, they are not washed away, whilst the young obtain abundance of food. Thus, fish brought up before June and October respectively, would be in breeding condition if they were of sufficient age, and would of course be worth much more than non-breeding ones, unless the deposit of Ova were stopped by the change of temperature. Many of the fish in the Seegoor River have finished breeding at the end of the south-west monsoon; but the Bowany commences from the south-west quarter, and flows to the north-east, so fish may be found in it which breed at both periods. It is probable that in the first year the Ova will come to nothing, or that, at all events, a large proportion of them will be barren; but the second year the fish ought to breed. As a rule, young fish bear transporting better than large ones: but they must not be very young fish, as the infant Carps die rapidly. The large fish require more oxygen than the small, and they also beat themselves about more, and get frequently injured in the transit.

My first experiments in conveying fish in India were made in tin cans between Billicul and Ooty, Pykara and Ooty, and Seegoor and Ooty. In two of these first attempts I had the assistance of Mr. Batecock, of the Government Gardens at Ooty, and of some coolies who could be thoroughly relied on. When the experiment was carried on, on a larger scale, I extended my distance to Mettapolliam, 25 miles from Ooty, and above double the distance from which I had previously

brought them. It may safely be asserted that, with increased distance, the probabilities of success are proportionately lessened, and I found many experiments necessary, and much time occupied, in devising the best methods of conveyance, and ascertaining the proper season of the year. There is only one fisherman on the Hills; and this man, who had assisted me in my original experiments on a smaller scale, unfortunately became ill, and I could not obtain his services. At first, I always rode by the side of the coolies from Mettapolliam to Ooty, leaving the former place about 6-30 P. M., and arriving at the Lake about 7 A. M., having changed the bearers at Coonoor. This personal supervision was necessary, for the purpose of inspecting the success, or the reverse, of each mode of carriage; the best plan respecting changing the water; and the rapidity of death, with the manner in which it occurs in the various species experimented upon. Had I not been present, the reports given me might have been true or the contrary (I could not depend upon them); and from these statements I might have drawn erroneous conclusions. Some of the information thus obtained has been utilized, although much still remains to be practically tested. After I had eventually matured my plans, and had ascertained the species which bore transporting best, and the method most adapted to ensure success, I desisted from personally accompanying the coolies, as my presence was no longer necessary, and I found that riding up the cold ghauts at night time, frequently brought on bad attacks of fever, accompanied by other unpleasant symptoms. Thus, while employed in supervising the operations, I was also enabled to extend my researches into the fish found at other parts of the Hills, together with the time of year at which they breed. I also obtained, and brought in, species from Billicul, and elsewhere. When my plans were matured, and I had shown the manner in which fish could be successfully brought in alive to Ooty from the plains, I established a stock pond at Coonoor, and was able to make a contract by which the *Ophiocephalidae* and Carps were brought up and placed in this pond, from whence I personally removed them twice a week, and placed them either in the Ooty Lake or Pykara River, as I deemed best. I also made arrangements for receiving the large Carps (*Puntius Carnaticus*) at Ooty from Seegoor; also Eels from Mettapolliam.

There are several methods for the carriage of the fish, each of which has its advantages and disadvantages, viz., an

earthen chatty on a cooly's head; one large chatty slung on a bamboo, and carried between two coolies; two chatties slung one at each end of a bamboo, and carried by coolies; tin watering cans; a wooden tub slung on a bamboo between two coolies; or a cask placed on a cart. Good careful coolies are very necessary, as if they shake the chatties or cans much, the water splashes over, whilst the fish become frightened, and dash themselves against the sides, sometimes even jumping out, thus being greatly, and often fatally, injured. Therefore, a fine net should always be tied over the top of the carrying chatty or can, to prevent their falling on to the hard road. This shaking is especially perceptible in wooden tubs slung between coolies; and for the same reason casks on country carts without springs should be avoided. Care must be taken that the coolies do not empty out the water; for, as they are paid by the trip, the result is immaterial to them, and they occasionally lighten the load, by emptying it out at the commencement of the journey, and refilling the chatty when near the termination: on arrival, the fish are of course dead, but it is a very difficult thing to prove whether the water has or has not been tampered with. The inside of the conveying vessel should be as round as possible; thus the inside of chatties are especially suitable, whereas, when tin watering pots are employed, unless the spout is well stuffed with grass or leaves, small fish wriggle themselves up, and thus miserably perish. The vessel should in the day time, be well tied around with ferns or leaves, to keep off the effects of the sun's rays, and these again should be kept moist, to promote evaporation. Chatties carried on coolies' heads should have a small basket beneath them, as the men's hands become so benumbed, that there is danger of the chatty falling. I found that the safest and most expeditious plan was to have single chatties carried on coolies' heads (when they had two, they invariably emptied out the water, the weight being too great; and the chatties slung on bamboos were always greatly shaken). When fish are much shaken about in carriage for any length of time, they probably feel in their way as ill as do human beings, cows, horses, goats, and even the albatross, on board-ship, although the manner in which they suffer is not perceptible to us. Thus, amongst some young *Ophiocephalus gachuas* brought from Coonoor to Ooty—a distance of ten miles, the journey occupying three hours and a half—looked very tired; so they were placed one evening in a large tub of water, with plenty of leaves float-

ing about, and some grains of rice thrown on the top: the next morning, they were as lively as if they had just been removed from their native river. A tired fish may be easily recognized, as it does not look so bright and fresh, and the crown of the head is of a duller tint, whilst the dark greenish back looks muddy and of a lighter colour. The greatest injury to the *Ophiocephalidae* will almost invariably be found on the summit of their flat heads. It seemed at first doubtful how this occurred, but it was subsequently observed that it was occasioned by their jumping up, and hitting the top of their heads against the cover of the vessel containing them. This was obviated to a great extent by letting a good quantity of grass float on the water; but there must not be too much, or the fish appear to climb up on it, and jump from thence upwards—thus increasing, instead of lessening the danger.

In rainy weather, when there are cold winds blowing, tin cans are best suited for carrying the fish in, as the evaporation being less, the water does not become of so low a temperature as in earthen chatties. During the transit, a little water should now and then be removed from the vessel, and some more added from the nearest source; for in very cold weather, it will be found that water in its natural state is warmer than that in the chatties or tins. On warm days, the same plan should be pursued, for the purpose of oxygenation. Verarls (*Ophiocephalidae*) especially in the cold months, are best carried by mixing a large proportion, as much as one-sixth, of mud in the water. Eels, and Allarees (*Mastacembelidae*) should be conveyed in hollow bamboos, or in chatties, in wet grass mixed with mud. They must not be carried in water; for, if it is deep, they will be drowned. Open baskets are not advisable. On August 7th, at 4 p. m., nineteen large Eels were despatched from Mettapolliam in an Eel basket, and reached Ooty at 4 p. m., the next day. Neither grass nor mud had been made use of, no cumbles had been thrown over the basket coming up the ghaut, and they had not been placed in water en route; consequently, only two were alive when received. On May 24th, eight fine Eels were placed in a tub of water, at Mettapolliam; as they were continually escaping, a net was thrown over the top to prevent their exit, but a few hours subsequently they were all found dead. A *Mastacembelus armatus* shared the same fate from being carried up the ghaut in a chatty of water. Care must be taken that the coolies do

not tie cloths over the mouths of the chatties, to prevent the fish escaping.

It must be remarked that many deaths occurred amongst the fish, not from their having been brought up to the Hills, but from the shaking and consequent exhaustion sustained in the long journey, or from the cold experienced in the chatties going up the ghaut. The *Siluridae* (scaleless fishes) were least able to sustain this sudden change, and most of them perished before their arrival at Ooty. Two of them were put alive into the Coonoor stock pond, at the commencement of August, but on being removed two or three days subsequently, by means of a net, they were both found to be dead; whether this was occasioned by the temperature, the muddy bottom of the pond, or from exhaustion is questionable. During the end of May, I personally brought up one *Hypselobagrus cavasius* alive, and placed it in the Lake. Theoretically therefore, the *Siluridae* would be unsuited for the elevated plateau of the Neilgherries; but, practically, such may not be the case. Amongst the fishes sent me from the Wynnad is a *Bagrus*, a *Wallago*, and a *Saccobranchus*, and they are known to thrive well in that locality; whilst from the elevated district beyond Cottayam, in Travancore, I have received a *Bagrus* and a *Hara*. Therefore, we may practically infer that when their acclimatization elsewhere is attempted, they should be transferred in the hot months, during the night time, and we should not too hastily decide that they are unadapted to the Hills. Verarl and Eels can be conveyed at any period, but the former do best placed in a stock pond halfway up; the latter should be carried the entire distance in one journey. Carp from Seegoor seem to be best carried on a dull windy drizzly day, between the bursts of the monsoon, in tin cans. They should leave about 4 P. M., so that they may reach a stock pond formed in the Culhutti stream by 7 P. M., from whence they can be transferred the next morning to Ooty or Pykara. Stock ponds of stagnant water, like that at Coonoor, are not well adapted for keeping Carp for more than a very short period. When the young Carp are beginning to get about in droves, in July and August, it is a good season for bringing them up to Ooty.

A few experiments instituted showed the rapid change from heat to cold which some tropical fish can bear without injury, but which must prove fatal to others. July 7th was a very warm day, and the water in the Coonoor stock pond stood at

76° at 12 A. M., and was of course, the same in a chatty, which before leaving, was carefully surrounded by moist fern leaves. It contained nine live Koravas (*Ophiocephalus gachua*—Ham. Buch.) which arrived at Ooty at 4-45 P. M., when the air was 62° and the water in the Lake 67°, while that in the chatty was only 55°. They were all well, although in less than five hours, they had experienced a decrease in temperature of the water in which they were of 21°; they certainly seemed to like their transfer to the warm lake. Still the cold on that day was nothing comparatively speaking to that experienced on the ghauts, where however, it was impossible to read off the temperature by moonlight. On another day, when the heat was much the same as above, whilst bringing in fish from Billicul to Ooty in tin cans, I found, on arriving at the latter place, at 6 P. M., that the temperature had sunk 13°, but was only 5° less than that of the lake. The decrease of temperature is in fact, nearly twice as great in earthen chatties surrounded by moisture, as it is in tin cans. The coldness of the water depends upon the evaporation, which is increased or checked by many disturbing causes, but is chiefly affected by the rapidity of the current of air, and the amount of moisture in the surrounding atmosphere. Thus, at the commencement of the monsoon, with cold and comparatively dry winds rushing down the ghaut, the water in porous chatties rapidly cooled, and the same also obtained after a few dry days in the monsoon; but when the rain had continued uninterruptedly for days, the evaporation became slight, and the difference between the temperature of the air and the water was not great. As a rule, water is 1° colder in chatties than in tin cans. To ascertain this accurately, I placed a similar earthen chatty containing water in an open verandah out of doors, with the wind blowing upon it, and a tin watering can of water by its side. The difference in temperature was as follows:

	6 A.M.	8 A.M.	10 A.M.	12 A.M.	2 P.M.	4 P.M.	6 P.M.	8 P.M.	10 P.M.
Temperature of air....	59	58	60	62	59	62	58	59	58
Do. of water in chatties	52	57	57	57	59	60	56	62	61
Do. of " in cans....	53	58	58	60	60	64	57	62	61

In the hot months of the year, chatties should be used in the conveyance of fish. They should be only two-thirds full of water, and care should be taken that they are sufficiently strong to bear the weight of the fluid. In the cold months,

tin cans are best adapted for this purpose. Bright moon-light nights should, if possible, be chosen for these experiments, as artificial lights do not admit of such strict scrutiny over the coolies as they require.

Of course, fish must feel the rapid changes of temperature in the air during the ascent. Persons going up the ghauts, who are accustomed to similar variations, and are warmly clad, still feel it greatly, and how much more so must fish, who find their native element getting colder and colder, until it eventually becomes very much lower in temperature than the water in its natural state on the summit of the Hills.

If it is necessary to keep fish for a night, in order to transmit them elsewhere on the following day, they should be placed in a wooden tub near an open window, in a well aired room. It must be covered by a net, to prevent their jumping out; plenty of grass should be floating on the surface of the water; and a little very finely chopped raw meat thrown in. The *Ophiocephalus gachua*s, if left without food, will bite the red tipped tails of their fellow-prisoners, probably mistaking them for meat.

As I found that many fish died between Coonoor and Ooty, probably from the length of the journey being too great, I determined on making a stock pond at the former place, and this plan succeeded admirably. This was not established with the idea of inuring them to the change, but to avoid the large proportion of deaths from exhaustion; for a tired, hungry fish, which had been cramped up in a tin can or chatty, would not be likely to finish the journey from Coonoor to Ooty so well as if it had had a good rest, and been fed for a few days in the pond. In reducing theory to practice, I found that several fish which were apparently dead, and must inevitably have been so before long, had they continued the journey, revived on being held in the warm hand in the water of the pond. Mr. Smith, of Woodcot, obligingly placed a pond in his garden at my disposal for this purpose. This I ascertained had been in existence many years, as newly-made ponds are not adapted for the reception of fish. On one side we cut a deep channel, so that, when necessary, we could empty out nearly all the water, whilst the stream on the other side, which supplied it could easily be turned on or off. In the cold months, everything should be done to facilitate removing the fish as easily as possible, for the coolies do not like standing about in the water, as they become very cold, and

frequently attacks of fever are engendered thereby. A drag-net is a necessity, it should extend quite across the pond, and must be heavily leaded to prevent the escape of the Verarls, which dive down into the mud. As no drag-net was procurable in Ooty, and I could not obtain the services of a fisherman with one, I was obliged to make one myself. It was thirty feet long, by six deep. If the fish arrive before sun down at a large piece of water like the Ooty Lake, they should be placed in the eastern side, so that they may obtain as much as possible of the sun's rays. Verarls should also be put in near some rocks in the water, under which they may hide, and Carp near weeds; but these must not be too thick, as, when first placed in the water, the fish require time to recover, and if they get caught in the weeds, there is danger of their being drowned. If they turn over on their backs or sides, they should be retained in the hand, and held in the natural position in the water; in this way, they generally recover, and quietly swim away. They should not be placed in deep water, as they do not appear to recover so easily as in the shallows, and it is much colder. The spot should be carefully watched for an hour or two, as in their exhausted condition they can be easily captured by the hand.

I considered it best to establish distinct colonies of fish in the Lake, by turning them in at different parts, and therefore introduced some at the northern end, some at the Willow Bund, and others in apparently favorable localities. Whether this will answer practically, by disseminating the species over the lake, remains to be proved; at all events, the probabilities are in its favor, as from one end of the lake to the other is a considerable distance for fish to spread without assistance, and they might only have remained near where they were placed originally.

The following are the number of each species safely transported by me into the waters of the Neilgherry Hills*, in 1866:—Eels 16; *Puntius Carnaticus* 28; *Ophiocephalus marulius* 2; *Ophiocephalus striatus* 10; *Ophiocephalus gachua* 149; and some of *Labeo Dussumieri*, *Rasbora Neilgherriensis*, *Paradanio aurolineatus*, *Barilius rogosus*; besides a few *Puntius gracilis*, *Puntius filamentosus*, &c., making 116 more.

Having obtained 60 days' privilege leave, I availed myself of the opportunity of proceeding to Ooty, in July 1867,

* Exclusive of those imported by myself prior to May 24th.

for the purpose of enquiring into the result of my experiment.

I brought a drag-net with me from Madras, and was thus in a position to examine the fishes placed in the stock ponds of the Government Gardens, where they had been introduced about a year previously from Billicul, and the Pykara and Seegoor rivers. This examination afforded a good criterion of the progress of these in the lake, although it must be observed that I do not believe the ponds in the Government Gardens are as suitable for the residence and propagation of fish as either the Ooty Lake or the Pykara River.

With the assistance of Mr. Batcock, I dragged three of the stock ponds in the Government Gardens with the following results. All the fish captured were (with the exception of four) returned to the various tanks. The *Paradanio aurolineatus*, *Rasbora Neilgherriensis*, and *Paradanio Neilgherriensis* were larger and more brilliantly coloured (demonstrating their excellent health) than any hitherto obtained, either in the Billicul Lake, or in the rivers of the plains, from which they were originally imported. In the first haul of the net in the centre pond of the Government Garden, many *Paradanos*, a few *Rasboras*, and two of the *Barilius rugosus*, or Indian trout were enclosed. In another pond, into which about a dozen and a half of the *Paradanio aurolineatus*, and *Paradanio Neilgherriensis* had been turned, we took out sixteen fish from the upper half, the lower being too deep to net.

As regards the *Paradanio aurolineatus*, the number of adult and half grown fish were certainly more than were originally placed there; whilst numerous young fry, too small to be taken in the net, and about half an inch or upwards in length, could be seen in droves; and the old specimens were full of roe. This is a conclusive proof that the waters of Ooty and the upper plateau of the Neilgherries are well suited for the fishes of the plains of India, if we may judge from the manner in which these three species of the Carps are thriving. The *Rasbora Neilgherriensis* have also increased, but not to so great an extent as the *Paradanio*; but the females were full of roe, and specimens of the *Paradanio Neilgherriensis* were in the same healthy and increasing condition.

It was evident that the fish which were introduced last year, many of which at the time were full of roe, must have

bred in the Government Gardens, for only on this supposition can their increase in numbers be accounted for, and a fair number of young were evidently reared last year; whilst this season the fry are very numerous, and the increase may be expected to be large.

Before leaving Madras, I applied to Colonel Denison for a few of the *Gouramies Osphromenus Gouramy* (Cuv. and Val.) brought from the Mauritius, proposing to convey them to Ooty, feeling confident that they would thrive in the lake. He immediately acceded to my request, provided we could find any alive in the People's Park; but, unfortunately, when we dragged the tank in which 40 had been placed, the water was found so brackish, and the bottom so foul, that all were dead, apparently from the locality, as they require fresh, clean water.

After finding the Hill waters were adapted to low-country fish, and knowing the *Gouramy* breeds in warm temperatures, such as the Mauritius and Cayenne, although originally from China, where the temperature is often lower than it is on the Neilgherries, it appears to adapt itself to various degrees of heat, and would certainly thrive in the Lake. I therefore strongly urged some of them being obtained from Madras and brought to Ooty. The voyage from the Mauritius occupied fifteen days, and out of fifty fishes kept in buckets of water, changed once daily, only three or four died; consequently, they appear to be easily carried.

My application met with approval, and on August 27th, I left Ootacamund for Mettapolliam, where, at 8-30 A. M., the following morning, I received charge of three casks containing ten specimens of this fish.

Without detailing all that was done, I may mention that all the fish died in the cask which contained four; but the remaining six were placed alive in the Ootacamund Lake.

The fishes received weighed one and a half pounds or upwards each, and appeared to be in excellent health, but their size was rather above that which is advisable for carrying long distances, especially if the locality to which they are being despatched is at the top of a ghaut, for the larger the size the greater the risk. Fish of about a quarter of a pound in weight, would be the most appropriate if procurable. Casks were the only vehicles in which such large fishes could be conveyed. So long as they journeyed by rail, the danger incurred was but slight; but when they were carried by coo-

lies, the risk of mortality increased, which again became augmented as the ghauts were reached, and rapid ascents arrived at. The following plan appears most appropriate for the conveyance of such large fish, each cask having had a sufficiently large air hole cut at one end, should be then filled about one-sixth part full of pond weeds, and two-thirds full of clean fresh water. The fish having been introduced, and the open hole having been netted over, the cask has to be slung on end, and suspended by strong ropes to a bamboo; a little straw round the bottom of the cask will prevent its sharp edges cutting the suspending ropes. Thus the casks are carried like palanquens and as the ghauts are reached, cross bamboos have to be attached, to enable more individuals to be employed for their conveyance.

The food for the Gouramies during these journeys claimed my especial attention, to ascertain which I dissected those which died, and found that they partially at least, subsist upon the small pond shells so common in tanks at Madras. These were fed upon rice, but from experiments which I made this year in Madras, I do not hesitate to affirm that, if too large a quantity of rice is given to fish, so that some remains in water to putrefy, which it rapidly does, it becomes highly deleterious, and often causes the death of the fish. Too much chopped meat acts in much the same manner, whilst the live pond shells attach themselves to be weeds and do no injury to the water.

The proper time for carriage is most essential, of course the sun has to be avoided, whilst to enable the coolies to travel easily at night time, the period chosen should be as near the full moon as possible. The fish should leave Madras by the night train, arriving at Coimbatore at midday, the water should be immediately replaced by fresh, and some pond shells and a very little rice thrown into each cask: they must be in a verandah, not inside a house; they should not leave until 6-30 P.M., which would afford ample time for their arrival at Kullaar before 6 A.M., on the succeeding day. Fresh water should be put at once in each cask, again at midday, and also in the evening before starting. They should be fed once during the day, and about 6 P.M. leave for Coonoor, where they should be placed in a pond and kept for a week, after which, they could be removed with safety to the Ooty Lake.

The Gouramy is a perch-like fish, requiring fresh water

to live in, and hardly adapted to rivers. It is said to grow to 30lb. weight and upwards, is of a most delicate flavour, and far superior to any Indian fresh-water fish for the table. Originally a native of China it has been domiciled mostly through the energy, perseverance and scientific knowledge of the French, in the Mauritius and elsewhere. Peculiarly adapted to tropical climates for it possesses a large receptacle in its head for water (like the climbing perch and several other tropical fishes), it may be kept alive for some time even after it has been removed from its native element. I have already shown that tropical fishes will thrive and breed on the Neilgherry Hills after they have been introduced, and there seems no reason to fear but that fishes as the Gouramies must prove an eventual success at Ootacamund, as they have in so many different and distant places, provided a sufficient number are brought up.*

It is consequently highly desirable that, if possible, some more be sent to Ootacamund. I believe not less than six brace placed alive in the Lake will suffice to ensure success: I would certainly advocate twelve brace, if such a number could be spared. Some may succumb after their arrival from exhaustion due to the shaking they have undergone, or to injuries sustained from knocking against the sides of the cask or against one another, or even from change of climate; besides there are occasionally otters in the Lake.

As I conclude more of these excellent fish may be expected from the Mauritius, I would beg to suggest whether they are very desirable acquisitions for the town of Madras, where so many varieties of excellent marine species are available, or whether they are not more adapted for inland stations, where fine tanks of fresh-water exist, peopled by fish which few Europeans consider fit for the table, and then only because they cannot procure better. For instance Bangalore, to which place they could be despatched by rail without any mortality, where proper tanks exist for their reception. On the Shevaroy's again, and as the line of rail extends, other stations might, if it were desired, be similarly supplied. Specimens from one quarter to half a pound in weight would be best adapted for sending to Ooty, from half a pound to a pound to the Shevaroy's, and from one pound and upwards to Bangalore, whilst,

* Government have ordered November 8th 1867 in consequence of my report that a further supply shall be sent to Ooty when received from the Mauritius.

to wherever they are sent, four years protection at least must be afforded them, and all fishing prohibited.

If my views as to the easy extension in this Presidency of such excellent fresh-water fish as the Gouramies are considered feasible, and an augmentation in the animal food is desirable, I would suggest whether a most excellent opportunity does not now exist of practically carrying them out. His Excellency the Governor of the Mauritius appears interested in the subject: from him these fish might be procured to an almost unlimited extent, ship communication is easy, whilst from the town of Madras, they may be extended to many inland stations at a small outlay. The most expensive journey will be to Ooty, and if we take the cost of the six fish already safely introduced into the Lake as a basis of calculation, and allow for two dozens more, it may be completed at a total cost of less than four hundred Rupees from the period they leave Madras, to when they arrive at their final destination.

Taking the vast expanse of the sea board of India, no restrictions appear to exist as to the time of year, or the method employed in the capture of fish; any one may take them as he pleases, without fear of any judicial interference, and this liberty extends to all, including natives of Ceylon, foreigners from the Persian Gulf, from China, and many other parts. This privilege does not arise from prescriptive rights, or in any way owing to hereditary immunities, as it is well known that fishermen in Native States paid taxes on their nets, and often a percentage on their captures. This law was even enforced by the Dutch in Malabar, and by the Portuguese at Goa, who also decreed that no fish could be sold, or even given away, until the Catholic Clergy had taken either what they required for their personal use, or deemed necessary for the religious establishments under their control. In the same way, the Native Princes had always enforced a tax invariably upon all fresh-water fish captured. In British Burmah, also, I observe that in the sale of tracts of country, amongst other reservations are all rights with regard to the fisheries of the rivers in those parts. Private rights cannot interfere with Government preservation, excepting perhaps in those cases where Europeans have purchased Coffee Estates with all rights over the streams flowing through their estates, provided they do not diminish the supply of water to their neighbours. In a despatch from the Home Government to that

of Fort Saint George, in the Revenue Department, No. 13 of 1843, it is requested that all matters relating to the Neilgherry Hills be adjudicated, and in paragraph 63 "that the control of all streams and canals be in the hands of Government."* In the *Manual of Instructions for the guidance of the Revenue Officers of the Coimbatore District*, in the disposal of applications for land on the Neilgherries, and sanctioned by Government, December 19th, 1849—in continuation, January 7th, 1850, *Revenue Department*, No. 1213—is the following paragraph:—

"It is clearly understood that Government reserve to themselves in the fullest manner the complete control over all streams, springs, reservoirs, and channels of irrigation. No stream is to be diverted, nor its water taken for purposes of irrigation, without the special cognizance and sanction of the Revenue Authorities of the district. Springs, streams, rivulets, &c., should, when practical, be specially exempted from the lease." If the control be still in Government hands, and not rendered obsolete by custom, it is evident that it must be in the power of Government to pass any order it considers necessary for the purpose of improving the rivers and streams on the Hills, or the Ooty Lake which is certainly entirely Government property. Amongst such orders, the protection of existing fish, and the propagation of new species, would be a legitimate subject for consideration.

The Ooty Lake, which is the largest piece of water on the Hills, and in the centre of a large European community, is of great consequence. Unfortunately, it cannot be denied that of late years the upper end has silted up, and, before many more seasons have passed, it is not improbable that that portion above the Willow Bund will be dry. Two causes have apparently contributed to this: that most immaterial in point of quantity, but most injurious from its deleterious quality, is the drainage of the Native Bazaar, which, foul in smell to a degree, and in every way detrimental to health, finds its outlet in the Lake. This will probably be entirely obviated after the new drain has been constructed along its side.

That this is merely an experiment cannot be forgotten, but still, if it is successful, as I have little doubt it will be, it is capable of leading to the most useful results as a whole. The

* Outhertony's "Memoir of the Neilgherry Hills," p. 45.

first thing is to ascertain which species of good eatable fish will breed on the Hills without deterioration, and then the important question arises whether we cannot give other countries, of the same temperature as the Neilgherries, fish, to people their hitherto uninhabited waters, which are at present lying useless and unemployed, or have very few fish in them. The *Ophiocephalidae* are the best edible species; and if they breed and thrive in the waters on the Hills, there is no reason why they should not do so in those rivers of Australia which have been found too hot for the propagation of Salmon and Trout, or even in the South of France and Southern Europe generally; and they might easily be transported to the Mauritius. What a vast field of inquiry is here opened to the Pisciculturist! And surely one which would be of the greatest service to so many of our fellow creatures is well worthy the consideration of a Government.

Then, again, looking nearer home, the question must arise whether nothing can be done to protect large tanks and suitable pieces of water in the vicinity of large towns and Military Stations, from the constant poaching and indiscriminate destruction of fish now going on. Could not many of these watery wastes be made subservient to raising good edible fish for the population, and which by enforcing certain restrictions, might always be sufficient? Surely, this might easily be done, and although it might throw a few fishermen temporarily out of employment, this ought not to stand in the way of such a vast increase to the food productiveness of the country. The presence of fish is also well known to be most serviceable in conservancy.

The English Government at the present time is enacting laws for the prevention of the suicidal policy of the wholesale destruction of the fluvial tribes, and enforcing regulations for their preservation. In France, it is well known that stocking rivers and pieces of water with fish, and the acclimatization of species from other countries, is a work of great public utility, and has so largely increased the supply of food, that the subject is now placed under the administration of the same department of the State as are the roads and bridges.

For the preservation of the fishes placed in the Hill waters, I suggested, should the experiment be completed, the protection of the Ooty Lake and the Pykara and Avalanche rivers; for practical results can only be expected in proportion to the pains taken to develop them; and fish imported to the Hills,

and unprotected, are not more likely to thrive and increase so situated, than they are in the plains or in European waters. Surely now when so many have been introduced, they should be taken care of.

The first question which would have arisen, had the experiment been completed in October 1866, would have been when fishing might safely be commenced. They breed at from two to three years of age; but it is unlikely that those brought up in 1866 will deposit Ova the same year. It may therefore be considered that the first breeding season will commence in 1867, and that only with those which were at least a year old when brought up. After the breeding season in 1869 will, therefore, be the earliest period for the fishing to begin, unless the number of fish be greatly increased, and this cannot be done without a corresponding increase in the expense. The number brought up must be in accordance with the money laid out, and it may be estimated that the cost of capturing them, carriage, &c., would be about ten Annas a head for the best sorts, such as the *Ophiocephalidae*, the large Carps and the Eels.

Secondly, the question of "closed months" is very important, to allow the fish to deposit their Ova without disturbance, as it is highly necessary, at least for the first few years, that they should not be interrupted during the breeding season. This is generally during the south-west monsoon, which begins on the Hills about the middle of June; only a few breed during the north-east monsoon. I would, therefore, propose that no fishing be allowed from June 15th to September 15th of any year, in the pieces of water previously mentioned, or in any stream joining them, within a hundred yards of the junction, as spawning fish invariably go up small streams to deposit their Ova.

During the time fishing is allowed, all netting, or other engines of destruction, should be strictly prohibited, with the exception of Eel baskets in the Lake, and only rods and lines should be allowed to be used. In Europe, a certain small sum is charged for permission to angle, and if a similar plan were adopted on the Neilgherries, it could be open to no objection, and the proceeds might be employed to protect the fish and pay the conservator. This arrangement would be fair both to Europeans and Natives, as the latter do not angle for sport, but to sell their captures. At the present time, a small cup full of Minnows sells for four Annas; but let netting be stopped and conservancy adopted, for every cup full of fish

taken now, there will be a bucket full when the fish are in good order.

I pointed out the advantage of completing this experiment, now so nearly finished, which in an economic light, appears of great importance; whilst, should it be successful, it may be extended by future utilization to the plains. I proposed that, for the completion of the experiment, two dozens more of each of the following species should be introduced, both into the Ooty Lake and the Pykara River, viz., the *Labeobarbus*, *Puntius Carnaticus*, *Ophiocephalus Marulius*, and *Ophiocephalus striatus*; and from conclusions deduced, and experience gained during the progress of my experiments, I suggest that the proper period for completing the experiment would be from the middle of August to the middle of October—previous to this, the young fish, which must be employed, are scarcely ready for removal, and subsequently, the weather is too cold for the purpose.

The following order was passed by the Madras Government in receipt of my report.—“The Governor in Council directs that the thanks of Government be conveyed to Surgeon Day for his useful and interesting report on the streams of the Neilgherry Hills, and on the experiments which have been made under his direction, with the view of stocking those streams with fish. The Government concur in the conclusion at which Doctor Day has arrived, that the prospects of success are so small as not to justify any further expenditure in connection with the introduction of Trout into the Neilgherry streams; but, with the view of completing the experiment of introducing fish from the low country, they desire that the Collector of Coimbatore will instruct his Special Assistant to make the necessary arrangements for procuring two dozens more of the several species mentioned in the last paragraph of Doctor Day's report, for the Ootacamund Lake and the Pykara River. This should be done, as Doctor Day suggests, between the 15th August and the 15th October. The Collector will inform his Assistant that the Government are much interested in the success of the experiment, and that all the precautions suggested by Doctor Day should be carefully attended to.”

* Since this paper was in type the result of this trial has been received.

30 *Ophiocephalus striatus* were sent from Coimbatore, 7 reached Kulliar alive, none lived to the top of the ghats.

None of the *Ophiocephalus marulius* could be found in the Bowany river.

Twenty fish termed *Poo Meen* *candee* were turned alive into the Ooty lake,

2. The Government are not prepared at present to legislate for the preservation of fish during the breeding season. On the Neilgherries, however, where complete control over all the streams, reservoirs, &c., has been reserved to Government, there is no reason why the Magistrate should not prohibit fishing at such seasons as he may deem proper. Mr. Grant will report what orders he may think it advisable to issue on this point.

The Secretary of State for India, in a despatch dated 23rd. August 1867, transmitted to the Madras Government a copy of a letter from Colonel Haly, together with its enclosure from Sir Arthur Cotton, on the subject of the destruction of fisheries in Indian rivers, caused by anicuts constructed near their mouths, and remarked “that the subject is of sufficient importance to be deserving of the attention of the local Government.”

and having sent a sketch of the head of this species to Coonoor a Native cook who dressed those which died, recognizes in the drawing a likeness to two of the fish. He says they were ten inches long and full of roe. It is to be regretted those which died were not preserved. Another trial is contemplated next March which it is to be hoped may prove a complete success.

ART. VI.—*Concise History of the outbreak of Cholera in the District of Vizagapatam, 1866.* By C. A. ANDREWS, Civil Surgeon.

(Communicated by the Inspector General Indian Medical Department.)

In the month of April 1861, the whole of the Northern Division was visited by epidemic Cholera, and the Town of Vizagapatam (which had enjoyed an immunity from the disease for some years,) with other large towns in the district suffered severely. From that time to the present, the district has never been entirely free from Cholera, and it has frequently appeared in an epidemic form amongst the prisoners in the Vizagapatam Jail, accounts of which will be found in the Annual Reports.

In the month of December last, on the 19th and 20th, four cases occurred in the Jail, and I found upon enquiry that the disease existed at Tingarvarupacottah, Chupurapilly and Parinitapoor; these towns are situated from thirty to sixty miles from Vizagapatam, and the convicts who were attacked were not recently incarcerated, so that there was no connexion between the cases in the Jail, and those in the distant towns mentioned, unless there be such a thing as a general atmospheric state causing a tendency to this disease.

From December 1865 to the beginning of July last, frequent reports of the existence of Cholera in the above-named towns, as also in Salur, Veeranilly, Gunapoor, Palacodah and Kupilly in the north, and Nursipatam, Pellamunchilly, Ankarpilly and Urutla in the south were received. In March it was reported to be in Allipoor, a village adjoining Vizagapatam and half a mile from the Jail, and it also appeared in Garlapallium, a small village close to the new Jail, upon which the prisoners are working. About that time, two cases occurred in the Jail, one or two cases again occurred in the latter village in June, and I am informed there was one death from Cholera on July 4th. On July 6th the epidemic commenced in the Jail, the average admissions were about two and a half daily, but

the fluctuations were very great; on some days there were no fresh admissions, and on others five or six would occur: the mortality fluctuated in the same way, one day three out of four would recover, on another all would die. On August the 5th there were two admissions and five deaths, three of them being admitted on the previous day; since then only two cases have occurred, and as there have been no admissions for ten days, I trust the epidemic has ceased.

During the epidemic there were—

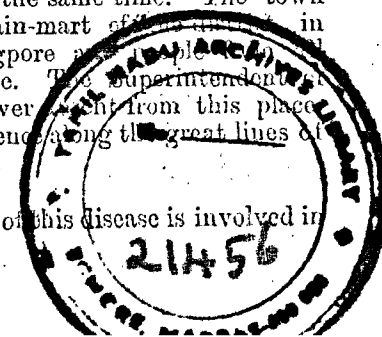
	Admitted.	Died.
Hill men.....	40 ...	26
Low-country men.....	42 ...	23
	82	49

About one-third of the convicts are Hill men, and the above numbers will show how much more severe the disease has been among them, than the inhabitants of the plains. During the epidemic in the Jail, four police-men of the Jail guard were attacked, and were taken to the Police Hospital for treatment. Of these, one died and three recovered. The first case occurred on the 16th of July.

The Lunatic Asylum is in the same compound with the Police Hospital, and contained 28 inmates on the 18th of July; on that day a Lunatic was attacked—subsequently there were seven cases among them and five deaths. Since then the epidemic has been and is now rather severe on the outskirts of the town, but the heart of the town is tolerably free from it at present.

ORIGIN OF DISEASE.—I have been able to obtain no reliable information as to where the disease first originated. It seems to have commenced in several parts of the district, remote from one another, about the same time. The town of Parvitipoor is the great grain-mart of the district, in which the Binjaries from Nagpore and other parts of the district congregate. The Superintendent of Police reports that Cholera is never sent from this place, and it generally travels from thence along the great lines of traffic in unhealthy seasons.

CAUSES.—The primary origin of this disease is involved in



obscurity, but the proximate cause is, beyond doubt, infection; if this wanted proof, the fact of the Police-men from the Jail guard conveying it to the Lunatics, is quite sufficient. I am convinced of the existence of a specific poison, an infectious miasm which may remain dormant for months, and then, under circumstances favourable to its development, reproduce the most virulent form of the disease. A short account of the several outbreaks in the Jail will illustrate my theory.

During the epidemic of 1861, Cholera broke out in the Jail. Soon after it commenced in the town, and the prisoners suffered severely: after the disease had ceased, great mortality took place from cachectic diseases. In January 1862, the epidemic again broke out in the Jail with great severity, although the town was quite free from the disease. The prisoners were moved into camp on high ground, freely exposed to the air on all sides, and the disease immediately ceased.

It was at first supposed that the water from the Jail well had produced this outbreak, but the well was sealed up, and the epidemic continued. During the absence of the prisoners, the Jail was thoroughly cleansed, the walls were scraped and white washed, the stone-floors were scoured and covered with charcoal, and the ventilation was greatly improved. After five weeks the prisoners returned to Jail in good health; in ten days the disease broke out with all its former virulence. The prisoners were quickly removed to camp, and the disease again immediately ceased; the prisoners remained in camp four months, and again every effort was made to cleanse and purify the Jail. At the expiration of that period, they returned to Jail in good health, and remained so for six months, when the disease re-appeared; a removal into camp, as before, caused a sudden cessation of the epidemic.

The prisoners now remained in camp six months, at the end of which period it was thought advisable to place them in the Jail on account of the approaching rains. In three weeks the epidemic re-appeared; they were then removed into the present temporary Jail and, as before, the disease immediately ceased.

A most rigid enquiry has shown that in no instance was

the disease brought from the outside, as those first attacked had been years or months incarcerated.

The old Jail being abandoned, the prisoners have remained huddled, while a new Jail is building. They enjoyed an immunity from Cholera for nearly two years when the disease being epidemic in the district, they also were attacked, and the same thing has again happened this year. The severity of the epidemic is, I think in a great measure, owing to overcrowding.

NATURE AND CHARACTER OF THE DISEASE.—Epidemic Cholera is generally described by writers on the subject as being preceded by a period of incubation, during which the premonitory symptom of diarrhoea makes its appearance, and that this period extends from a few hours to some days. This is totally opposed to what I have observed in the Jail. Premonitory symptoms are quite the exception, the patients are almost invariably brought into Hospital in a state of collapse, within half an hour of the first purge or vomit.

In 1861 some of the patients were purged once only and died within an hour or two. The type of the disease this year has not been so severe; those who died in collapse lingered from ten or twelve hours to two days, and many who rallied from that state died four or five days after, from congestion of the brain, or lungs, or from effusion into the pericardium, but although the disease has been less rapidly fatal, the mortality has been nearly as great as in 1861.

I have long ceased to regard this disease as having any thing in common with diarrhoea, and am convinced that the patients do not die from exhaustion caused by excessive evacuation, as many appear to believe. There is no doubt that the disease is the result of a morbid poison, which taken into the blood through the lungs, paralyzes the action of nervous and circulatory systems, and finally that of all the vital organs, the capillaries become congested and the serum is forced out by more mechanical action upon the mucous surface of the bowels causing the evacuations peculiar to Cholera; the lungs cease to appropriate oxygen, or the circulation is too feeble to carry it on, hence the absence of chemical combustion resulting in the peculiar state termed collapse.

TREATMENT.—Taking the above view of the case, it appears to me that the indications are, to support the strength, to stimulate the nervous and circulatory systems and administer such medicines as are known to act as oxydizing agents, but unfortunately the poison is more powerful than any remedy yet known, and when absorption and nearly all vital actions are in abeyance, it is difficult or nearly impossible to carry out any successful plan of treatment.

I administered Tinct. Ferri, Sesqui Chloridi mxx . every quarter of an hour as an oxydizing agent at the commencement of the epidemic, and it apparently answered well in cases where perfect collapse has not taken place, but when the patients had reached that stage, it was found to be as useless as any other remedy. After this the collapsed cases were treated with effervescent draughts containing Acid Hydrocyanic dil. m.x . and Brandy 3ii . every half hour or hour, according to symptoms, followed by congee with a little Brandy or Arrack or chicken-broth; the draughts allayed the vomiting, were grateful to the patients' feeling and enabled them to partake of nourishment afterwards. In addition to this, Ammonia and Ether were frequently given and sometimes Calomel and Opium, the latter being very cautiously used, in fact great care was taken to avoid overstimulation or narcotism, and yet many of the patients died in the congestive stage succeeding to the collapse.

Although the deaths amount to nearly sixty per cent. of those treated, it must be remembered that they were prisoners, and more than half of them Hill men who readily succumb to disease, and frequently pine away without any symptoms or disease at all, being unable to bear incarceration.

ART. VII.—*Report upon Cholera in the District and Station of Trichinopoly.* By J. L. RANKING, Surgeon-Major Madras Army, Acting Garrison Surgeon, Trichinopoly.

[THIS Report, together with others which we hope to publish in the first number of the Second Series of this Journal, was drawn up in compliance with the following Proceedings of the Madras Government. We are much indebted to the courtesy of the Inspector General Indian Medical Department, who has placed these documents at our disposal for early publication.]

No. 242. Read the following letter from W. Mackenzie, Esq., M. D., Inspector General Indian Medical Department, Acting President of the Cholera Committee, to the Acting Chief Secretary to Government, Fort Saint George; dated Madras, 19th July 1867.

No. 216, dated 27th February 1867, appointing a Committee for advising Government as to the arrangements necessary for giving practical effect to the recommendations of the British Cholera Commissioners.

With reference to Proceedings of Government as per margin, I have the honor to solicit that Government may be pleased to direct all civil and military authorities to place at the disposal of this Committee the information indicated in the accompanying Tabular Return.

2. The object of this Committee is to investigate, to the fullest extent possible, how far the conclusions at which the International Cholera Conference at Constantinople has arrived (with regard to the nature and progress of Cholera) are supported by what has been observed in this Presidency; also, to draw from these communications practical conclusions as to the means which should be adopted for the protection of the community from outbreaks of this disease.

3. It is important, therefore, that the information afforded should be as accurate as possible.

4. In describing places either remarkable for the prevalence or absence of Cholera, any information connected with the topographical, geological, or other features of the

MR. ANDREWS on an outbreak of Cholera.

with unqualified condemnation, and we must endeavour to carry out by other means the *two* capital indications prescribed for our guidance." "*Partial and moderate astringent only*" is said to be not only the best and safest course (which is possible) but also "thoroughly consistent with the pathology of the disease here assumed;" (which we do not see). According to the principles which we have laboriously learned, partial astringent of the intestines will involve partial astringent of the liver too, whereas the indication is to "unlock" the latter. Why "gently and gradually reducing the superabundant flow from the surface of the bowels" should "gradually incite the liver to a modulated and daily increasing habit of secretion, till at length that healthy equilibrium is attained, when we may withdraw our medicinal aid, and trust to the awakened and now well-directed operations of nature," is not explained, nor does it appear to us explicable on Dr. Macleod's principles, or by his theoretical pathology. However, we confess we do not care much for the correctness of his theory if his practice is successful: and this we have no reason to doubt. Mineral astringents are free, he tells us, from the objections to which catechu, kino, opium, &c. are obnoxious, and possess the required property of "constringing the relaxed bowels on the one hand and stimulating the liver on the other." He has obtained great success in his treatment of chronic dysentery from the use of salts of zinc, copper, iron, silver, lead, and bismuth, and of the mineral acids, (especially nitric and muriatic), changed tentatively to suit each particular case. There is nothing particularly novel in his plan of treatment, except, perhaps, his avoidance of opium in combination with the mineral styptic selected. The value of nitric acid in the treatment of chronic dysentery, on which our author lays great stress, has long been known, but Dr. Macleod gives us some hints for the administration of it, which are worthy of notice. He reserves this remedy until the mineral salts have been tried, and have failed either altogether or after temporary benefit. He gives it in doses of from five to ten minims, made into a mixture with water and honey or sugar, and believes that in this form the acid is less likely to injure the teeth or to disagree with the stomach. For the use of nitric acid in enemata Dr. Macleod claims the merit of originality; and though, as we have seen, he set out with a determination to make no use of his own experience, we are happy to find

him forgetting his resolution in this instance. We quote his remarks on the subject:—

"I have tried the nitric acid injections in some hundred cases, both of chronic dysentery and of acholic diarrhoeas, and with still increasing conviction of its value: so that I now regard it as the easiest, safest and most speedy means of securing the specific effect of this valuable remedy. It may be used either in the small and concentrated form already described, or as an ordinary enema, in the proportion of 3iv.—3vi. of the diluted acid to a pint of warm water or gruel. In either case it is better to commence with a moderate strength, to be gradually increased according to the effect and feeling produced. As a general rule it will be found that the older the disease, and the more conspicuous the signs of ulceration, the greater the strength of the acid that may be borne. For it is probable that in a healthy state of the membranes such a strong application would cause considerable pain. In all cases, therefore, before using the concentrated form, the presence of indolent ulceration should be ascertained by inspection of the stools.

"The use of the injection is quite compatible with the contemporaneous exhibition of other remedies, or with that of the acid itself in the form of draughts."

On the whole, this chapter on Chronic Dysentery is the best in the book, contrasting strongly with the chapters on Cholera which follow it. From these we learn that "cholera is an imponderable matter, or condition of matter." As every thing but solar light and heat—the actinic rays being, we presume, of no account—is "tellurial," cholera is so too, and therefore must be either of animal, of vegetable or of mineral origin. Not being atmospheric (because it can travel against the wind) and having no properties in common with malarious fevers which are of vegetable origin, cholera cannot be of vegetable origin: and besides, if it were "instead of arising at one point of the earth's surface, and then progressing or radiating to others, we should find it appearing at distant points simultaneously, wherever the necessary vegetable conditions existed." Again, "if there be no vegetable much less can there be any animal conditions confined and peculiar to the place of its birth"; and it is not contagious like plague and small-pox, therefore it is not contagious at all; as it would be if of animal origin. Not, then, owing its existence to vegetable or animal parentage, it must be mineral; which is confirmed by the fact that unceasing changes are going on in the crust of the earth. Comment on this extraordinary demonstration would be superfluous.

former river dividing just above the town of Trichinopoly into the two branches named above.

The "Delta of the Cauvery" is contained within these two rivers, and forms nearly the whole of the district of Tanjore.

8. The Collectorate comprises tracts or areas which differ materially from each other in their physical characters and in the nature of their soils.

Generally speaking, the three talooks to the north of the Cauvery (before its bifurcation) and the Coleroon, may be termed the "uplands," as they are on a higher level than the southern talooks, and but little, if at all, influenced by the rivers as to their irrigating and fertilizing powers.

The talooks of Kulatalli and Trichinopoly to the south are, on the other hand, on a lower level, and Trichinopoly derives the full advantage of irrigation from the river.

9. Hence the talooks may be divided into "*wet*" and "*dry*," the former signifying *relative* rather than *absolute* preponderance of wet cultivation.

10. The subjoined table exhibits the areas of these different talooks, their population, and number of inhabitants to the square miles.

Talooks.	Area in square miles.	Population.	Number of Inhabitants to each square mile.
Trichinopoly.....	518 ...	2,55,397	... 493
Moosari.....	657 ...	2,26,273	... 344
Kulatalli.....	924 ...	1,90,880	... 206
Woodiarpolliem....	773 ...	1,90,204	... 246
Perambalore.....	693 ...	1,44,072	... 209

11. Trichinopoly, it will be observed, is par excellence, the wet talook of the district, and is the most populous, having 493 inhabitants to the square mile.

12. The relative amount of land under *wet* and *dry* cultivation and waste is exhibited below. The figures apply to Ryotwarry land only. The "waste" is assumed to be the difference between the whole area, and that under cultivation.

	Area in square miles.	Cultivated.		Waste.
		Dry.	Wet.	
Trichinopoly.....	415 ...	132.1 ...	110.3 ...	172.6
Moosari.....	486 ...	271.2 ...	33.5 ...	181.3
Kulatalli.....	502 ...	279.8 ...	24.2 ...	198.0
Woodiarpolliem	773 ...	198.8 ...	17.5 ...	557
Perambalore.....	693 ...	309.2 ...	11.7 ...	373

13. During the year 1866 the following is the recorded mortality for each talook :—

	All Causes.	Cholera.
Trichinopoly.....	23.59 ...	6.94 per 1000.
Moosari.....	24.12 ...	7.30 "
Perambalore.....	24.72 ...	5.51 "
Kulatalli....	27.80 ...	10.19 "
Woodiarpolliem..	31.67 ...	13.46 "

14. Trichinopoly with the largest amount of wet cultivation and the minimum of waste, has the lowest mortality from "all causes" and the second lowest from cholera.

Moosari stands next in order both as to amount of wet cultivation, waste and mortality by all causes, and is the third on the list as regards mortality by cholera.

The three other talooks, which are essentially *dry* talooks, have collectively the largest mortality from "all causes" and by cholera.

By cholera alone Perambalore has the lowest mortality of any talook.

15. The effects of cultivation, and notably of *wet* cultivation upon the public health, and especially upon the prevalence of cholera, as illustrated by the deaths from that disease, would appear to be demonstrable, but the period of observation is too short to admit of any further comment. The enquiry may be considered worthy of being followed up in other districts.

16. The District of Trichinopoly according to Mr. Blandford, comprises portion of an ancient sea bed of the secondary age, and consists of a series of rocks which present the lithological and palaeontological characters of the upper cretaceous system. These are overlaid by tertiary formations (sandstones, laterites and nodular limestones) and covered by soils which are represented by (1) ancient

alluvium or 'regur,' (2) modern fluviatile alluvium, and (3) lateritic gravels and ferruginous sandy loams of a dark-red color.

In the northern talooks crystalline rocks, granite and gneiss, rise from beneath the cretaceous rocks, and 'bosses' or tabular masses of gneiss are found studded over the whole face of the district, and formed headlands in the ancient cretaceous sea.

The soils are distributed generally as follows. To the north of the rivers and at the base of the hills the 'regur' or "cotton soil," which is in this district very unproductive overlies the cretaceous rocks, which rise from beneath it on the flanks of the granite and gneiss formations.

The fluviatile alluvium constitutes the surface soil of the whole delta of the Cauvery, and the low levels generally, thinning out and being covered on the higher grounds of the southern talooks by the red ferruginous soils and laterites.

17. I have no data upon which to arrive at any conclusions as to the influence which these different soils exert upon the origin and spread of cholera, as affecting that is either its endemic or epidemic prevalence.

18. The German Professors Grusenger Max von Pellenkoffer and Wunderlick lay considerable stress upon the local or temporary predisposition evinced by soils especially, in relation to variations in the level of the subsoil water.

They advance, for instance, that when an impregnated porous soil has been unusually saturated with water, so that the air has been pressed out of it for an unusual time and to an unusual height by water, the rapid subsidence of the water favours the epidemic development of Cholera in such places; and that the more the surface layers are impregnated with decaying organic matters, the more dangerous will be a recession of the surface waters.

This subject is well worthy of investigation in India.

It has long been known that Cholera is prone to assume an epidemic form at this station, and throughout the district of Trichinopoly in the cold months of December and January; and no explanation of the fact has been, to my knowledge, offered.

That it is a fact the tables of prevalence of the disease which I shall presently give, both as relates to European and Native troops to the station and the district, will sufficiently prove, and it is at that season of the year that the

conditions of soil and subsoil water above alluded to certainly exist.

From July to the end of September, or part of October, the great rivers roll towards the ocean in a succession of freshes, flooding large areas of the country and saturating the soil.

Towards the end of October the rivers subside, and with their subsidence there is a general lowering of the subsoil waters, drying of the surface, and decomposition of organic matters, conditions upon which Pittenkoffer lays much stress, especially when associated with the existence in the soil of the specific cholera germ, and which I shall adduce evidence to show has been sown extensively in the soils of this district.

19. I now proceed to answer the several questions included in the order under report, and first in regard to the *Cantonment and Station*.

Table A in the Appendix exhibits the admissions and deaths amongst European and Native troops for 10 years, and for each month of the 10 years from 1857 to 1866.

From this table the following conclusions are arrived at—

1st.—That the disease has prevailed every year amongst Native troops, and that European troops escaped its ravages only in the one year 1862.

2nd.—That amongst Europeans the years 1858, 1861 and 1866 are marked by the largest prevalence of the disease.

3rd.—That 1858, 1861, 1863, and 1865, present the greatest extension of the pestilence amongst Native troops.

4th.—That while as regard Europeans the prevalence declined from 1861 to 1865 inclusive, amongst Natives it rose during the years 1862, 1863, 1864 and 1865.

5th.—That while European troops suffered so much in 1866, Natives almost escaped.

The disease is therefore clearly endemic at this station.

As regards the periods of its epidemic spread, the table also shows that this occurs with considerable regularity at two periods of

the year notably during the cold months of October, November, December and January (and especially in December

and January) and less markedly in the months of June and July. In the latter months Europeans would appear to present a greater 'receptivity' to the disease than Natives.

20. As regards the district, I have compiled a table from the Mortuary Returns for the year 1866, showing the number of villages in which the disease prevailed or was absent.

The towns and villages are classed according to the following arbitrary arrangement:—

	Per cent.	
	Attacked	Escaped.
Villages under 1000 inhabitants ...	7.5	92.5
„ from 1000 to 2000 do. ...	21.9	78.1
„ „ 2000 to 5000 „ ...	29.9	70.1
„ „ 5000 to 10000 „ ...	35.8	64.2

The result is what might have been anticipated from the known influence of *numbers*, (that is, masses of the people, in association with a polluted soil, air, and water supply) upon the origin and spread of the disease. The proclivity to the disease is in a certain, but not arithmetrical ratio to the number of inhabitants.

21. The influence of seasons, or of those telluric and atmospheric conditions which mark the different months of the year and which may stand in certain, though not easily definable relation, to the spread of the disease, is exhibited below.

Months.	Ratio per cent. of villages.	
	Attacked.	Escaped.
January.....	17.5	82.5
February.....	12.3	87.7
March	4.5	95.5
April.....	8.9	91.1
May	5.6	94.4
June	7.5	92.5
July	11.7	88.3
August	12.6	87.4
September.....	10.2	89.8
October.....	9.1	90.9
November.....	9.1	90.6
December.....	10.8	89.2

22. Very much the same results are obtained from these figures as from those representing the prevalence of the disease amongst the troops.

The cold months from October to February show the largest prevalence of the disease as indicated by the number of villages attacked.

The mean for this period is 11.76 per cent. The mean for December and January only is 13.5.

The hot months of March, April, May and June give a percentage of 6.6 only.

The percentage again rises in the months of July, August and September. The disease thus prevailed more or less during every month of the year 1866, was in fact endemic with epidemic extension notably in the cold months, and less extensively in the dry and hot months.

23. Some time prior to the receipt of the order which is the subject of this report, I requested the Collector to afford me such information as was in his power, as regard to the festivals and fairs held in the district in their relation to the origin and spread of the disease under consideration.

The information given (as conveyed in form B in the appendix) is very meagre.

It was scarcely to be expected that information solicited under the orders of Government now under report, would be more satisfactory or explicit.

I have now before me a copy of the report by Mr. Agnew to the address of the President of the Cholera Committee.

The fact of the endemicity of the disease throughout the district is advanced therein. In para. 4 of the letter Mr. Agnew alleges that many of the worst cholera spots are in the irrigated villages.

This is quite in accordance with the known habit of the pestilence to cling to low levels and to follow the course of the streams and water-courses.

But I have elsewhere shown that irrigation *per se* does not favour those conditions of soil and atmosphere, that are associated with an unusual spread of the disease.

The talook of Trichinopoly, for instance, with the largest amount of wet cultivation by irrigation has the second lowest rate of mortality, and the average is favourable to the irrigated talooks.

That the disease spreads along the main lines of human intercourse is also advanced as a "*belief*" by Mr. Agnew, who in the concluding paragraph of his letter, gives me more credit for the possibility of affording the result of scientific observations than I lay claim to myself.

In fact the more one attempts to arrive at any conclusions, the more one feels that the data at command are unreliable; and that such information as is required to aid the Committee in determining how far the conclusions arrived at by the Cholera Conference are borne out by observations in India, must be sought in the future and is not obtainable from any existing records.

24. The Returns called for will be found appended and filled in as far as lies in my power.

25. In future it will be possible to tabulate annually from the mortuary returns furnished by Collectors the names of every village exempt from cholera, and thus, after a series of years, it may be possible to ascertain whether any villages are really exempt from outbreaks of the disease, and if so, to trace the conditions which favour such exemption.

26. It occurs to me that if Civil Surgeons were furnished with maps of their districts projected on a large scale, they might indicate monthly upon such maps all villages in which deaths by cholera occur.

This might be done by a series of black dots, and these dots might be so arranged within a small circular space as to show the month or months in which deaths occur.

The dots, for instance, might be arranged from left to right in 3 lines of 4 in each line within a small circle thus  which would indicate that deaths had occurred in every month of the year.

The upper left hand dot would represent the month of January and so on as a sequence from left to right. The absence of any dot would show that particular month represented by it was free from cholera, thus  which would show that March, May, June and August were free from the disease, or the month of prevalence might be marked by a large dot, those of absence by a mere point thus

Maps thus filled in for a number of years (say five) with the years entered above the circles might be very usefully analysed with a view to determine sundry questions, such as the points of commencement of any epidemic, its spread or otherwise along highways or streams, its proclivity to periodic outbreaks at given localities and others which will suggest themselves.

These maps might be furnished quinquennially to Civil Surgeons.

They would be somewhat similar to the "Wreck charts" published in Europe.

27. I also beg to append a form of Register of Cholera cases comprising the principal points requiring elucidation, and which I framed some time since.

A.
MILITARY.
Table of Admissions and Deaths by Cholera at the Station of Trichinopoly, for each month, from 1857 to 1866 inclusive.

Years and Strength.	January.		February.		March.		April.		May.		June.		July.		August.		September.		October.		November.		December.		Total.	
	A.	D.	A.	D.	A.	D.	A.	D.	A.	D.	A.	D.	A.	D.	A.	D.	A.	D.	A.	D.	A.	D.	A.	D.	A.	D.
Europeans.																										
1857	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1858	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1859	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1860	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1861	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1862	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1863	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1864	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1865	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1866	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Natives.																										
1857	8	3	3	1	1	1	1	1	1	1	7	4	1	1	1	1	2	4	1	1	3	4	2	12	5	5
1858	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1859	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1860	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1861	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1862	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1863	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1864	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1865	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1866	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1867	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1868	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1869	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1870	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1871	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1872	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1873	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1874	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1875	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1876	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1877	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1878	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1879	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1880	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1881	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1882	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1883	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1884	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1885	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1886	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1887	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1888	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1889	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1890	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1891	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1892	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1893	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1894	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1895	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1896	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1897	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1898	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1899	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1900	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1901	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1902	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1903	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1904	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1905	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1906	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1907	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1908	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1909	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1910	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1911	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1912	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1913	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1914	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1915	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1916	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1917	33	15	8	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	2	12	56	
1																										

The Annual Returns for 1864 of the 15th and 16th Regts. N. I. not having been received they are not exhibited here.

(True Copy) (Signed) J. L. RANKING,

Surgeon Major.

Acting Garrison Surgeon.

(Signed) J. A. REYNOLDS,

Deputy Insp. General

Indian Medical Department, S. D.

B.
Table of Festivals, Fairs, Pilgrimages &c, held in the Trichinopoly District.

Names of Festival.	Town or Village at which held.	Date of celebration.	Number of days it lasts.	Nature of Festival whether commercial or religious.	Probable number of people assembling on each occasion.	Has cholera broken out within the last few years (say 5.)	Remarks as to the mortality whether large or small, attending the outbreak and its spread by the people on the assembly dispersing.
Cotta Ootsavum, Chitray Feast.	1. Seerunghum.	December or January and March and April.	15	Religious.	50,000		Mortality is large and no correct account appears to have been kept. It generally breaks out when the assembly is dispersing.
Called after the names of these places.	2. Counsel.	October.	10	Do.	40,000	Yes.	
	3. Totiam.	March.	10	Do.	2,000		
	4. Seerunghum.	April.	15	Do.	5,000		
	5. Veerupoor.	February.	10	Do.	4,000		
	6. Kadavoor.	February.	10	Do.	2,500		
	7. Seravatoor.	March or April.	10	Do.	3,000		

(True copy)

(Signed) J. L. RANKING, Surgeon Major,

Acting Garrison Surgeon.

(Signed) R. RUGANATH ROW,

Deputy Collector.

D.
Proposed form of Cholera Register.

Number of Cases in each of the following	
Has the Patient visited any place at which the disease prevailed.	If so, how many days prior to the attack.
Visitors from any affected locality.	Are there or have there been in the Patient's house.
Cholera Cases.	And if so are they either.
Diarrhoea, do.	Or, goes dead from Cholera.
Have any effects (as noted herein) been brought into the house from a Cholera patient or locality.	Has the Patient been exposed to any powerful occasioned cause.
Month.	Day.
Hour.	Place.
Street or Military Lines.	Number of house.
Number of occupants of house.	Name of place; &c., if Military, give Regiment and Lines.
Name of Patient or deceased.	Sex.
Male.	Female.
Age.	Date of Death.
Duration of case from attack to death (days and hours).	Caste.
Nature of treatment.	Remarks.

(Signed) J. L. RANKING, Surgeon Major,
Acting Garrison Surgeon.

ART. VIII.—*Observations on the Extension of Epidemic Cholera in India.* By W. AITKEN, M.D., Surgeon Major, Madras Army, Zillah Surgeon of Rajahmundry.
(Communicated by the Inspector General Indian Medical Department.)

It was, I think, in 1849 that my attention was first specially directed to this subject. I then received a letter from the Superintending Surgeon of the Northern Division, sent by order of the Medical Board, directing me to make inquiry about the occurrence of any epidemic visitation of cholera in Russelkondah.

I then ascertained by reference to all available records and by inquiries of all classes, official and non-official, the remarkable and apparently reliable fact that there had been no such visitation during the fifteen years it had been occupied as a Military station. This testimony was confirmed by Col J. Campbell, C. B., who was well acquainted with the history of the station.

Sporadic cases or, more properly speaking, cases of cholera morbus had occurred from time to time, and I had treated some of these myself with a successful result in all of the cases; but no case, so far as I could ascertain, of the true pestilential or epidemic character had ever occurred within the limits.

I learned, however, that it occasionally prevailed in the villages between Russelkondah and Berhampore, in some instances with considerable severity, and that at one time during the first Goomsur War it had attacked the troops stationed at Nowgaum, a village about two miles from Russelkondah.

The result of the inquiry caused me some surprise, and led me to look more closely into the matter than I had ever done before, as well as to seek for some explanation of this immunity apparently enjoyed by the station.

The explanation of the exemption was apparently not far to seek—at least I soon found a reason which seemed to me to account for it in a pretty satisfactory manner.

I found that the visitations in the surrounding villages generally occurred at the time of the year when intercourse between them and Russelkondah was almost entirely cut off by the flooding of the rivers and the submersion of the roads

I may almost say of the whole country, by the rains of the South-west Monsoon.

Ingress to Russelkondah during almost the entire continuance of the monsoon, which lasts from May to September, could then only be effected by fording the river, which sweeps round the station, by boats; and as the wants of the inhabitants could generally be met within itself by the customary preparations for the interruption of traffic, there was little or no communication with the adjacent country during the times of special hazard.

This I concluded, and not any peculiarity of soil or climate to which I had heard it attributed, was the source of the immunity.

I very soon had an opportunity of verifying my conclusion, and I was glad to find that the result did not disappoint my expectations.

During the following monsoon the advent of the pilgrims from Juggernaut brought back a man and his wife to one of the villages between Aska and Russelkondah, who had been on pilgrimage to that shrine. A few days after their return they were both attacked by cholera and fell victims to the disease. It speedily spread through the village, and from it extended to others until it came close to Russelkondah, affecting them all very severely. The rivers were at the time in full flood, and as there were only two places at which it was usual to pass over to the station, I advised the commanding officer to post sentries at them, to prevent as much as possible ingress and egress. The barring-out was apparently perfectly successful, at least we had the satisfaction to find that we escaped without the occurrence of a single case, and that the disease had passed so entirely away that there was no need of any prohibition against intercourse with the neighbourhood on the cessation of the rains.

In a conversation I had with some of the officers of the 18th Regiment previous to these events, regarding the deserted state in which we found the villages along the banks of the Mahanuddy when marching with Colonel Campbell's force from Ungol to Boad, I attributed it to fear of ill usage from the troops, as the people were then in a rebellious state and might not unreasonably be afraid of something of the kind. The rejoinder was that this was a mistake, as they had equally found this to be the case when stationed at different points on the banks of the river. They stated moreover

that the people had come in freely to them from the jungles, and that on making inquiry they had been informed that they annually retired to the jungles during the passage of the pilgrims from Juggernaut to the Nagpore country on account of the dread they entertained of holding intercourse with them. One officer also informed me that the whole bed of the river near his post at that season was polluted by the bodies of pilgrims who had died from cholera. I was also informed that previous to the location of the companies there, the villagers had never seen Europeans, and dire experience alone therefore must have taught them the necessity and utility of the custom. I may remark also that in those days the people of those parts had not much fear of the law before their eyes, and that the arrival amongst them of a number of people with disposable effects, even of so trivial a value as clothing, would, I think, under other circumstances, have been esteemed a dispensation of Providence in their favour, not to be lightly esteemed, and that the disposal of the owners thereof after their own fashion would not have caused them much difficulty or any uneasiness.

In 1850, after the arrival of the Head-quarters and wing of the 18th Regiment at Berhampore from Russelkondah, a wing of the 36th Regiment passed through on its way to occupy Russelkondah, and relieve some companies we had left behind. There was no cholera at Berhampore on their arrival, nor had there been any previously in the town or lines. They brought to the encamping ground a number of men suffering from and recovering from the effects of cholera, but made no report of the condition of their camp to the station authorities. I heard privately, however, what was the state of matters, and went at once to the officer commanding to request him to interdict as far as possible communication with their camp, which was pitched on the encamping ground some distance from the town and lines, but, though immediate action was taken, it proved too late, as it was ascertained that a goodly number of men had already visited the Towu bazaar.

On the following day a number of cases were reported in the town, where it continued to prevail for some time. Happily, however, the precautions were successful so far as regarded the lines as no case occurred either amongst the sepoys or followers, and I feel assured that had there been any, I should have heard of them.

The Wing of the 36th Regiment passed on to Russelkondah with what effect on the line of route I cannot say, but they carried the disease with them to Russelkondah, and into it for the first time.

The disease gradually abated in Berhampore and died out during the succeeding rainy season. During the cold weather the town was healthy, and continued so until the return of the pilgrims from Juggernaut in the following year. Every precaution was then taken to prevent, as far as possible, the entry of any of these wayfarers into the station, as it was hoped by keeping them off and making them pass by a less frequented road to the south of the limits, we might escape the evils they carried with them.

The town, however, is a large straggling place, and after dark, in all probability, some of them had managed to escape observation, and made their way into it, for some days after the approach of the first parties cases began to occur in the town.

It went on spreading until its ravages were perfectly appalling, in some few houses I was informed of as many as nine or ten of the inmates having died out in the day. Of the effects of the ravages I had ample proof in my daily walks and rides, as the custom there is neither to burn nor bury the bodies until there is some abatement of the disease. Till this takes place they merely cast them forth on the fields, their belief being that until their grim goddess Kali, who is supposed to eat the bodies, is satisfied, it will continue to prevail, and at that time the whole vicinage of the town was a horrible charnel-house, where dogs, pigs, jackals and vultures held high carnival.

Notwithstanding its virulence in the town, the lines continued free from any attack for some time, this freedom being evidently due to restricted intercourse. It appeared at last to have been introduced by a sepoy on leave from the Detachment at Chetterpore. He fell ill on the road, went to his house and was shortly after brought to hospital in a state approaching to collapse, although he stated that he had only vomited and purged once or twice. One of the orderlies who attended on him was, I think, the next case received into hospital from a house in the same Company's

Lines. It then spread over the whole of the Lines, and carried off, so far as I remember, above forty sepoys and many of the followers.

So great was the dread of the disease amongst the country-people there, that many of them told me although they were exceedingly anxious to make the pilgrimage to Juggernaut on account of the supposed benefits, and although the inducements to do so were very great, it being only about 90 miles off, and the festival happening at a slack time of the year for field labour, they were so afraid of contracting cholera that they could not make up their minds to it.

I was also informed that the adventurous few who did muster up courage enough to run the risk invariably came away the first day of the festival, as they considered it almost certain death to stay longer.

Of the ravages it makes at Juggernaut, one can form some estimate from the fact which was communicated to me by two visitors, Europeans, who stated that they had counted eighty bodies early one morning on the place to which they are usually dragged by the sweepers.

In marching about the Division, a good deal of which duty fell to my lot during two years, I may say, of almost constant life on the roads, I had many opportunities of tracing and inquiring into the course of the disease as well as of marching on and through its tracks, as I visited in that time every station in the division more or less frequently except Nursapatam. I found that it invariably followed in the wake of the pilgrims, attacking most severely the villages on or near the main road, also that it occasionally penetrated to the more remote villages along the base of a range of hills which run north and south through the Division, but that it seldom or never penetrated into the hills. On one of these occasions whilst marching from Vizianagram to join a regiment at Ellore, I found nearly the whole of the villages along the road affected by it, some of them, especially the more northern, very severely; but it appeared gradually to pass away as I approached Rajahmundry. This I attributed to the lessening number of the pilgrims, few or none coming so far south, with the exception of a very few

who may be pushing to get to the interior by the Chanda road which branches off between Rajahmundry and Ellore.

These are the main facts of my own personal experience in connection with epidemics in the Northern Division, and I think that all or nearly all of the epidemics which happen in that part of the country can, with more or less facility, be traced to Juggernaut, which I consider the fountain and source of the malady.

My experience of the disease in later years has been chiefly in Madras, and especially in connection with the Penitentiary. My experience here has fully confirmed me in the belief which I now hold of its being one of the most infectious diseases we have; with in very many instances a very short period of incubation, probably not longer than from twelve to twenty-four hours. I have repeatedly observed in the Penitentiary that fresh batches of prisoners from the country brought it with them, and communicated it to the other prisoners, and this at times when there could be no reasonable suspicion of its having been contracted in Madras.

I could adduce many other instances within my own knowledge both in this country and in England in support of this doctrine, where attacks could without much difficulty be accounted for alone by apparently indisputable evidence based on this supposition. I shall content myself with drawing on the testimony of others in support of it in one instance only.

A Medical officer, formerly stationed at Tavoy, informed me that during his service there every epidemic which he had witnessed there commenced in October, and was clearly and distinctly traceable to the arrival of the first boats from the more northern parts of the coast on the breaking up of the monsoon. In one instance which he particularized, an emigrant vessel had got off her course and only reached the coast so late as the month of May: she made her landfall some distance to the north of Tavoy. The poor wretches, glad to escape from the prison in which they had been kept for some months, rushed on shore, scattering themselves among the villages, in every instance carrying death and destruction in their train.

My experience has led me to believe that the mode of

communication of the disease is the inhalation of an emanation from the persons and bodies of those suffering or deceased from it. That there is a sickly nauseous odour proceeding from the persons of those affected by cholera, nearly all who have come in contact with it will, I think, testify, and it is this, I believe, which propagates the malady according to the concentration of the effluvium and the predisposition of those who may be exposed to it.

During the time that I held the medical charge of the Penitentiary, I invariably observed that the attendance on cases of cholera produced a sense of general malaise, anorexia and general discomfort of the stomach and bowels, and in one instance when some very virulent cases followed the admission of some prisoners from Nellore, this was aggravated into what is called cholera. The Apothecary had a smart attack of cholera, and one of the hospital servants died. Indeed the hospital establishment were so thoroughly alive to the fact, that there was no need to enjoin that absolute and rigid attention to personal cleanliness which should be observed by all who are called to combat the disease.

This emanation also by pervading all articles of clothing or bedding which may be in use about the sufferers from cholera is, I believe, exceedingly apt to re-produce the disease in those who may have the disposal of them. In support of this idea I would adduce the experience of the late Dr. Baily at Milbank. He states in his report that during the epidemic there they baked a portion of the clothes, burned a portion, and boiled another portion, and that all who were exposed to the fumes of these processes contracted the disease.

There is yet another mode of propagation, and, I think, we might learn a lesson from the practice of our rude village neighbours before referred to, regarding it.

Their religion, so far as I can understand it, seems merely the embodiment of the experience of their wise men of former ages. These traditions have now grown from long usage into a faith, all or at least a large portion of the articles and injunctions of their faith, having a practical bearing on the temporal welfare of the people. In this way would I try to account for the exposure of the bodies already referred to in preference to sepulture or cremation.

The burning of bodies then, near town and villages, is I believe, another means of the propagation of the disease, seldom suspected, and this I believe to be especially the case when the process of combustion is slow and protracted.

The most scientific and accurate observers both in Europe and America seem to be gradually coming round to the doctrine of infection. For although they are not, as might have been expected, quite prepared at once to throw overboard the doctrine of non-communicability which they have so ably contended for, they now admit that there is a portable element capable of spreading the disease much more rapidly than Dr. Snow's theory would account for, in other words that it is a portable disease with a special virus or poison.

Recent experiences both in Europe and America has also convinced many that it is to a large extent a preventible disease, and there seems to be little doubt that if it could be dealt with after the manner of the cattle plague, it also might be stamped out.

Recent experience, however, has also shown how much may be done to limit its ravages by the organization of an efficient sanitary police, and by house-to-house visitation for the treatment of diarrhoea when the disease is prevailing in any district, or when a visit is to be apprehended.

It does seem remarkable, I think, that in a country like this, the seat and stronghold of the disease, there should not long since have been organized a special department for the administration of such rules as Medical and Sanitary Science may from time to time suggest for the prevention and restriction of the malady, as well as for taking special cognizance of every circumstance, in connection with the constantly recurring epidemics, likely to throw light on the nature of the disease, or to lead to more improved modes of treatment.

We have abundant evidence of how much has been done by vaccination for the mitigation of the evils of small-pox, and although we have no analagous means of operating in the case of cholera, we do not I think attach sufficient importance to the investigation of the facts bearing on the rise and progress of cholera epidemics or to the benefit likely to accrue not only to the people of this country, but also to mankind over the world from such systematic investigation

ART. IX.—Notes regarding Cholera in the Mysore Country.

By J. KIRKPATRICK, M. D., Surgeon Major Madras Army, formerly Surgeon to Mysore Commission, in Medical charge 27th Regt. M. N. I.

(Communicated by the Inspector General Indian Medical Department.)

WHILE forwarding the accompanying return of cholera, I have to express my regret at my inability to answer the queries* with the precision desired.

The records of my present Regimental charge afford no materials for framing the return, but one instance of an outbreak of cholera in the Regiment related by Dr. Fletcher in his Annual Report for 1863, deserves to be referred to, as illustrative of the mode of diffusion of the disease. He writes, "This disease only appeared on the 7th December in the Sepoys' Lines. The first case was a woman, the mother-in-law of a sepoy, who had arrived from Vellore on the evening of the previous day, having passed through villages where cholera prevailed. She recovered, but on the 8th her grandson, aged 5, was seized and died. Since then three sepoys, one pensioned sepoy, eighteen women and eight children have been attacked; of the latter, one pensioned sepoy, two women and one child died, and all of them resided in lines Nos. 1, 2 and 3. The cases first noticed lived in line No. 2, and I have no doubt that the disease was first introduced by that person."

The medical history of my present Regiment being thus inapplicable to the purpose of making the return solicited by the Inspector General, I have been obliged to revert to my former experiences, particularly in the Mysore Commission, but being no longer in medical charge of it, such records as existed in it, are not now at my disposal, and even if they were, they would not furnish data for a correct account of the occurrences of cholera in the country, except at the Head Quarter Stations of the Divisions. Some memoranda however, which I have retained, and my recollections enable me to respond in some degree to the call for the information desired in the return.

I was in medical charge at Shemoogah, the third town in

* Vide page 106.—[Ed. M. Q. J.]

Mysore, from the end of 1849 till the end of 1852. In October and November 1851, a severe epidemic of cholera occurred at that place, and in the southern parts of the Nuggur Division. The outbreak originated at a place of pilgrimage near Arsekaira, about 45 miles from Shemoogah on the high road from Bangalore, and the approach of the disease through different towns along the road was noticed some time before it reached the station; one of the larger towns on the way however being as it were skipped over for a time. Almost the first case heard of in Shemoogah, was in the Jail, but as the prisoners were then much employed on working parties in the town, they could have intercourse readily with travellers. In 1852 there was again cholera in Shemoogah, and the disease has several times since as well as previously visited the town, yet it cannot be said to be endemic there.

In 1853 I was transferred to the medical charge of the Head Quarters of the Mysore Commission in Bangalore, and had then charge of the two Civil Hospitals till 1864. During this period not a single year passed without some cases of Cholera being brought to the hospitals, some being travellers brought in sick or taken sick shortly after arrival in the place, but it was only in 1860—1861, and 1862 that the disease could be said to be severely epidemic in the place. The visitation of 1860 was the most severe, and it had been preceded by the appearance of the disease in some of the towns along the roads from the eastward. In the years 1856 and 1859, there was, judging by the admissions into hospital, very little cholera in either the pettah or cantonment bazaars.

From returns of deaths by cholera, furnished to me by the Medical Officers, from the then four Divisions, I am able to give the following tables showing the prevalence of this disease in the Mysore Territories from 1855 to 1862 inclusive. These figures cannot be looked upon as conveying an accurate notion of the numbers of deaths in the district from this cause, particularly in the earlier years, and they do not include the deaths occurring in the Bangalore Cantonment, which in year 1860 amounted to over 700. One point however they indicate, which corresponds with my general observations at Bangalore, and it is the comparative rarity of Cholera on the Mysore Plateau during the colder months of the year.

Bangalore Division.

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
1855	5	6	50	2	7	...	...	25	309	200	50	20	686
1856	3	...	...	...	...	...	...	...	...	...	...	...	3
1857	...	...	204	296	153	218	93	37	1	71	40	...	1263
1858	...	...	1	24	7	...	18	...	53	41	36	9	189
1859	...	...	10	25	12	3	4	6	...	7	...	...	67
1860	...	...	...	...	...	...	106	356	186	172	22	37	879
1861	...	...	48	414	453	364	111	29	33	...	4	81	1537
1862	65	1	...	...	10	10	28	36	98	133	9	...	390
Total	73	7	379	761	642	595	360	489	770	630	161	147	5014

Chittledroog Division.

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
1855	...	...	...	...	...	...	...	...	...	5	64	...	69
1856	...	...	...	...	...	...	...	...	...	...	...	...	...
1857	...	...	...	...	...	...	...	...	...	...	...	...	...
1858	...	...	...	...	...	...	...	...	...	28	65	21	114
1859	38	...	...	56	198	58	395	86	82	1	...	...	914
1860	...	...	...	...	...	...	...	46	3	126	34	...	211
1861	...	5	69	83	185	833	320	68	12	24	24	...	1623
1862	17	11	...	...	35	33	51	70	55	...	...	2	274
Total	55	16	69	139	418	924	766	270	152	186	187	23	3205

Astragram Division.

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
1855	...	...	30	...	...	...	...	...	...	...	...	...	30
1856	...	...	...	...	...	...	...	...	...	...	...	...	...
1857	...	...	19	191	440	...	15	...	...	...	...	...	882
1858	...	...	...	...	...	...	...	...	...	13	34	113	160
1859	16	...	71	338	416	348	396	365	40	29	128	179	2320
1860	...	...	...	1	...	...	3	41	88	...	70	126	329
1861	86	114	702	1529	1344	674	44	36	20	...	25	65	4639
1862	4	12	18	...	...	...	...	2	...	...	49	120	205
Total	106	126	810	2059	2191	1239	458	444	148	42	306	603	8565

Nuggur Division.

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
1855	8	...	...	...	...	...	...	...	...	...	...	...	8
1856	...	10	...	...	...	...	...	...	...	...	...	...	10
1857	...	...	...	7	114	73	132	101	...	9	...	...	436
1858	...	...	...	...	...	...	...	...	14	36	42	...	92
1859	3	4	73	40	57	277	115	41	91	232	57	69	1059
1860	13	8	13	...	...	...	...	2	...	...	...	...	36
1861	...	...	...	59	706	856	232	98	17	10	22	9	2009
1862	...	...	131	97	186	84	92	19	11	...	30	62	712
Total	24	23	217	203	1063	1290	571	261	133	287	151	140	4362

I do not remember having heard during the time I held medical charge of the Mysore Commission of the spread of Cholera from any of the places of pilgrimage in the country, except in the previously mentioned case at Shemoogah, and in one at Soobramany on the borders of Coorg and Munjersad. In this instance the former Superintendent of Coorg informed me that he had traced the importation of the disease from village to village in Coorg by a traveller arriving in the first instance from the Jattrah, and subsequently by others from the places where the disease had been introduced. Such epidemics however may readily have occurred without my being aware of them as no special reports were made to me.

Previous to entering the Mysore Commission I had some experiences, gathered during marches with Troops, which have always seemed to me, indicative of the mode in which Cholera spreads. On five occasions I marched without meeting with Cholera in camp. These were either on short marches, or with small parties or through parts of the country which were at the time healthy. On five other occasions I marched with Troops, and the camps became affected with Cholera, and the following are notes of the latter occurrences.

On the 3rd of October 1843, I joined the camp (at Laulpett) and took medical charge of a detachment of Recruits

proceeding to join H. M.'s 15th Hussars and H. M.'s 25th "The King's Own Borderers." The camp had reached Laulpett the previous day, and was halting when I joined. There was slight Cholera in Laulpett at the time and the disease was said to be raging in the last stage, from which the detachment had come, and in which notwithstanding, it had rested, *i. e.* Gooriattum. On the morning of the day on which I joined the camp, a European soldier was seized with Cholera, and in the following six or eight days five more Europeans were attacked. Of these six, two died. Only one Native follower was taken ill with Cholera, but he recovered. Several cases of Diarrhoea occurred at the same time among the Europeans. On this point the state of the Natives was not known, as they did not apply for medical aid. The weather at the time the detachment was attacked by the disease was rainy and the ground on which they were encamped was low and almost swampy from the recent rains. The men had indulged freely in eating oranges, which are very plentiful at Laulpett. I believe the detachment had passed through no place in which there was Cholera till it reached Gooriattum. Consequently the disease broke out in it about thirty-six hours after it had been in an infected locality. It is not however positively known that there was no Cholera at any of the previous stages.

On the 28th November 1845, I left Trichinopoly in medical charge of a Company of the 39th Regiment M. N. I. en route to Paulghaut and Trichoor, having been ordered to proceed in that way to join the Left Wing of the 19th Regiment N. I. at Paulghaut. It was said that one or two cases of Cholera had occurred in the Fort at Trichinopoly before the detachment left, but none in the 39th Regimental Lines. On the third day of the march the camp rested at Munnassery, about three-fourths of a mile from the village in which there had lately been a few cases of Cholera and in which there were still dropping cases. On the 4th day we were obliged to rest close to the village of Caroor (for want of other halting ground), although aware that Cholera had broken out in the place about a week before and was still spreading. On the second day after leaving Caroor (*i. e.* one may say 36 hours after exposure in an infected locality,) a case of Cholera showed itself in the detachment. The weather, be it remarked, changed on the same day from dry

to rainy. The next day three severe cases of Diarrhoea with considerable prostration of strength presented themselves, and the day following that, several unequivocal cases of malignant Cholera appeared in camp. The disease then stuck to the detachment till it reached its destination.

On the 3rd January 1846 I left Paulghaut in medical charge of the Left Wing 19th Regiment N. I. en route to Cuddapah, but proceeded with them only as far as Bangalore. The line of country through which the detachment had to pass, had lately been ravaged by Cholera, but was known to be comparatively healthy again. The Right Wing of the Regiment had proceeded about three weeks previously by the route which the left Wing was now to follow, and had suffered pretty severely from Cholera. The Head Quarters of the 39th Regiment N. I. too which was slightly affected with cholera had arrived at Paulghaut two days before the Left Wing of the 19th commenced its march, and encamped close to the lines of the latter corps. At Coimbatore and again at Sunkerrydroog a few cases of Cholera were still daily occurring, being the end of a severe epidemic in both places. The camp was carefully pitched at some distance from both places, i. e. $1\frac{1}{2}$ miles from the first and half a mile from the latter. Notwithstanding these communications (though only slight) with infected localities and bodies, the Wing proceeded safely on its march till it reached Sogatoor, when a first case of Cholera occurred which was speedily followed by others, and the disease afterwards continued attached to the camp till the Wing reached its destination. The day previous to the appearance of Cholera in the camp the Wing had rested close to the village of Adamancottah, the authorities of which having stated that the village was then free of disease; but by after enquiry I ascertained that this was untrue and that Cholera had been in the village at the time the Wing passed it, the lie being got up to prevent the trouble of taking the supplies to the distance, it was known the camp would be pitched at from the village, should the Commanding Officer be aware of the sickness existing in the place I have mentioned that the Right Wing of the corps preceded the Left on its route by about three weeks, and that it too suffered from cholera. It seems it had halted a little way out of Coimbatore in which that disease was then raging, and two days after leaving the place Cholera broke

out in that Wing. After passing Coimbatore the villagers along the route informed us (of the Left Wing) that they had been healthy till the Right Wing passed, but that in a day or two after it had been with them, cholera appeared in their villages. The weather during the march of the Left Wing was very dry and rather warm for the season.

On the 20th February 1846 I left Trichinopoly with the 4th Light Cavalry en route to Bangalore. The weather during the march was fine and dry, but rather warm; there was no sickness in any of the villages along the road till we reached Oosoor, and there was none in Trichinopoly when we left that station. Two cases of Cholera occurred among the followers at a stage called Chalk Hills (near the camping grounds of the Wings of the 19th Native Infantry) and about five days after these four more in one day. Again there was an interval of four or five days before any fresh cases. These two fresh ones occurred at Oosoor on the evening previous to the Regiment's making one long forced march into Bangalore. The Regiment had halted the two previous days at Oosoor, and I believe a few cases of cholera had lately shown themselves in that village or in some of the immediately neighbouring ones, and these it soon afterwards proved were but the first of an epidemic in these places. In a day or two after entering Bangalore several cholera cases occurred among the Regimental followers, and the disease gradually spread in the lines and afterwards to the whole of the cantonment bazaar. It is said, however, that dropping cases of cholera had occurred in the general bazaar of the cantonment for some little time previous to the entrance of the Regiment into the station.

On the 27th March 1846 I joined the Left Wing of the 45th Regiment Native Infantry at Somapoorum (about 30 miles from Bangalore) and accompanied it on its route towards Trichinopoly as far as Namcal. When I joined the Wing it was still suffering, though but slightly from an attack of cholera which had commenced when the Wing was near the town of Mysore (in which at the time cholera was raging), and which had been very severe during its early part. The epidemic had been in the camp for about four weeks before I joined. Very few cases occurred after I joined, and the camp was reported free of disease when it halted close to Oosoor on the 1st, 2nd, and 3rd of April, in which village

cholera was raging. On the evening of the day we left Oosoor two fresh cases showed themselves, and in each of the next seven or eight days there were other fresh cases. The Officers of the Wing stated to me that they had had no cases of cholera till they had reached Mysore, and that they had passed through no infected locality previous to that place, that their Right Wing had been similarly attacked at Mysore by the disease, and that the villages after passing Mysore were also infected, and that the inhabitants had all stated that they had been healthy previous to their Right Wing's passing through them, but became sickly in a day or two thereafter. When returning to Bangalore after being relieved from this Wing of the 45th Native Infantry, found that several villages near which the Wing had rested were suffering severely from cholera. These at the time of the Wing's passing through them had been stated to be free of disease, and on my return the inhabitants told me they had had no sickness amongst them for nearly two months previous to the passage of the Wing, but that the cholera had broken out in each of their villages in a day or two after that event.

The foregoing notes were made on the 1st May 1847, and of course were then made from memory, no memoranda having been kept at the time the marches were made, but they are believed to be quite correct, as at the time of making them all points on which my recollection was defective were carefully omitted.

The following statement was drawn up on the 6th May 1847 from information given by Gopaulsawmy, 2nd Dresser of the 4th Light Cavalry.

"On the 18th of January 1847, 2nd Dresser Gopaulsawmy of the 4th Light Cavalry joined at Kingberry a detachment of Golundauze proceeding from St. Thomas' Mount to Cannanore. It consisted of 4 European officers, including the Assistant Surgeon, 2 ladies, 1 2nd Dresser, 140 Sepoys, and about 300 followers. Of these, 27 men were detached at Mundium to Mangalore. The detachment passed through French Rocks leaving 30 men there, and taking the relieved party also 30 strong with it to Cannanore. The detachment had marched through the Carnatic, in which there was a good deal of Cholera at the time it passed, and before Gopaulsawmy joined, the camp had been suffering from Cholera and had lost 8 men and a smaller

number of followers, and the Doctor had had a slight attack. After Gopaulsawmy joined, about 25 men and 20 followers were taken ill with Cholera; of these, 12 men and 9 followers died. Of these deaths, 5 sepoy and 8 followers were of the party which had been relieved from the French Rocks, being 13 cases and these all out of a number of 15 attached to one bandy which had been hired in Scringapatam, in which town there was and had been no Cholera for some time and there had also been none in French Rocks when the party left that station. The disease did not show itself among those attached to this bandy till the fifth day after leaving the French Rocks, and the eighth from the time the detachment entered the place, a halt of three days having been made. The survivors of the party attached to the bandy were the bandy-man and a young girl (3 years old) and neither of these were taken sick. Except in this instance, the victims of the disease came from all parts of the camp, but it was particularly noticed that nearly every man who acted as orderly to the sick in Hospital was attacked, and with them, it was remarked, that the disease seemed to be more severe than with others, yet the Dresser and all the dooly-bearers escaped. In the case of the bandy above mentioned, first a sepoy was taken ill and then the rest, each having acted as orderly to the others, their followers, with the exception of the bandyman, had also been much with them in Hospital cooking and otherwise assisting. The little girl was also occasionally at the Hospital and was therefore the only one of that party who was exposed to the infection and yet escaped."

I learned shortly after making the above note that in two or three days after the detachment of Artillery entered Manantoddy, Cholera broke out in that village, there being none in any of the neighbouring parts.

Though relating the above circumstances as instances of what I think may be considered unequivocal examples of the spread of Cholera by human intercourse, I should also state that my experience includes occurrences of the disease where such communication could not be traced, and the escape very generally of the Hospital Attendants from suffering from their attention to the sick. In a large station, like this where my experience has chiefly been, there is such free and extensive communication with other districts

ART. X.—Annual Report of Vaccination in the Madras Presidency. By JOHN SHORTT, M. D., General Superintendent of Vaccination, &c. &c.

(Communicated by the Madras Government.)

IN submitting the second Annual Report, since the re-organization of the Vaccine Department, I have the pleasure to state that the department has been more settled in its plan of operations, and the staff may be said to be complete, comprising—

1 General Superintendent.
11 Deputy Superintendents.
145 Vaccinators.
25 Peons.

2. The only changes that occurred among the Deputy Superintendents during the year, was caused by the death of Mr. Sub-Assistant Surgeon F. H. H. Smith, on the 9th May 1866, at Vizagapatam, from *coup-de-soleil*; the vacancy so caused was filled up by the appointment of Mr. E. A. Morris, who succeeded the late Mr. Smith in the Godavery Circle. Another change was anticipated, in the relinquishment of his appointment by Mr. Sub-Assistant Surgeon Mayley, and the nomination of Mr. E. Atkinson, as his successor. Mr. Atkinson not having joined, Mr. Mayley continued in full charge at the end of the year.

3. Drs. Thompson and Pulney Andy are permanent Sub-Assistant Surgeons, the former has been away for upwards of two years, and the latter one. Under these circumstances, I would beg to suggest their removal from the staff of this department, and their names in future borne on a separate list, in virtue of their permanent appointments.

4. The Deputy Superintendents on the establishment at the end of the year are the following :—

No.	Rank.	Name.	Circle.	Date of Joining.
1	Deputy Superintendent	L. W. Lincoln	Madras...	8th Aug. 1865.
2	Do.	W. Karney	Coimbatore...	24th June 1865.
3	Do.	C. St. J. Laforce	Malabar	27th May 1865.
4	Do.	W. Osman	Madura...	22nd June 1865.
5	Do.	R. Donaldson	Tanjore...	5th June 1865.
6	Do.	P. Kinsley	North Arcot...	15th June 1865.
7	Do.	W. H. Bealith	Salem	8th June 1865.
8	Do.	E. S. Mayley	Bellary...	29th July 1865.
9	Do.	T. Ward	Cuddapah	5th June 1865.
10	Do.	J. Sausman	Kistna	14th June 1865.
11	Do.	E. A. Morris	Godavery	16th June 1866.

5. On the whole I have been satisfied with the exertions made by the Deputy Superintendents of the several vaccine circles.

6. The past year was a trying one, and was extremely adverse to the propagation of vaccination, in consequence of the prevalence of famine and pestilence throughout the Presidency under one form or another; more especially was this the case in those districts that suffered from the extreme drought, namely, the Godavery, Cuddapah, Bellary, and Madura vaccine circles; nevertheless, contending with difficulties, caused by want and disease, endeavouring to overcome prejudice and apathy in their constant travels, my Assistants have worked cheerfully, and did their utmost to propagate the vaccine prophylactic as extensively as possible.

7. The following casualties occurred during the year among the Vaccinators :—

Hospital Assistants, removed.....	5
Vaccinators, deserted.....	3
Do. resigned.....	10
Do. dismissed.....	18
Do. died.....	2

The vacancies caused by the removal of the Hospital Assistants, were duly filled up by temporary Vaccinators.

8. Much discontent has prevailed among the Vaccinators from the absence of future prospects or eventual provision in the shape of pension, to which they might look forward in their old age, whilst the work was more arduous from constant itineration and greater liability to sickness. Great care has been exercised in the appointment of Vaccinators; but, under present arrangements, the old hands do not approve of the system of working, nor that of being removed from one district to another, owing to which the majority of the resignations and dismissals were due, and I may say, with advantage to the service. These old men were wedded to a system, and the plan of work under the new organization did not suit their views of ease and comfort, with nominal work; whereas, the new men fall cheerfully into the mode of work, when they once settle down to it.

9. At the close of the year there were but seven Hospital Assistants on the staff, and I believe that the scheme now before Government for enlarging the establishment will do away entirely with the services of these men, and the Vac-

persons themselves will benefit largely therefrom, as to present and future prospects, should the scheme meet the approbation of Government, and greater exertions may safely be anticipated for the future.

10. The work performed in the several circles during the year is as follows :—

CIRCLE.	Total number vaccinated.	Ratio per cent. of success.
Vaccine Depôt, Madras	4,627	90.27
No. 1, or Madras Circle... ..	4,767	92.97
" 2, or Coimbatore do.	28,373	87.69
" 3, or Malabar do.	17,445	85.93
" 4, or Madura do.	17,612	89.01
" 5, or Tanjore do.	22,405	87.54
" 6, or North Arcot do.	14,736	93.45
" 7, or Salem do.	17,034	88.14
" 8, or Bellary do.	18,864	83.35
" 9, or Cuddapah do.	5,519	90.86
" 10, or Kistna do.	7,159	85.26
" 11, or Godavery do.	6,148	80.93
Total...	164,689	87.63

11. From the above it will be observed that the average per-centage of success in the several circles varies considerably, the maximum being 93.45 in the North Arcot, and the minimum 80.93 in the Godavery Circle; whilst that of the entire Presidency, during the year 1866, was 86.38.

12. On comparing the aggregate numbers vaccinated during the years 1864, 1865, and 1866 separately, they stand thus :—

Year 1864.	Year 1865.	Year 1866.
311,587 ...	191,394 ...	194,509

From these figures it will be observed that, whilst there was so large a deficiency as 120,193 in 1865, compared with 1864, still the operations in 1866 have been increased to reduce the deficiency in comparison with 1864 to 117,078. It is necessary, however, to state here that in the report for 1865, the Mysore Returns were excluded for that year; and

no allowance being made for the exclusion of a total of 91,100, a larger deficiency became apparent than was actually the case, for this addition (Mysore Returns) to the total of 1865 would have made it 282,494, and thus have reduced the deficiency to 29,093. Following out the same rule this year, and adding 82,601 for the total of the Mysore Returns, a deficiency of 34,477 becomes apparent, increasing the total deficiency over that of 1865 by 5,384; this is accounted for by a decrease of 8,499 in the Mysore Returns for 1866, compared with 1865. Notwithstanding the inadequacy of the staff under the new arrangement, the work may be considered satisfactory, taken with the perfect reliance that can be placed on the operations carried out during the year under review, and will counterbalance the excess of former years.

13. Great pains are taken to keep the subject of vaccination constantly before the people; with that view not only are notices constantly given in the local papers and District Gazettes, both as to the advantages, and localities in which operations are being carried on, but a large number of treatises on vaccination has been either gratuitously distributed, or sold at cost price, throughout the Presidency. These comprised :—

Lectures in English	Copies	300
Do. Hindustani	do.	300
Do. Tamil, 1st Edition,	do.	300
Do. Do. 2nd do.	do.	1,000
Do. Telugu, 1st do.	do.	1,000
Do. Do. 2nd do.	do.	300
Do. Canarese, 1st do.	do.	1,000
Do. Oorya, 1st do.	do.	50

14. The English copies were published by myself, of which seventy copies were given to the Director of Public Instruction at cost price, and the remainder was made available for gratuitous distribution.

The Hindustani copies were published by a Mahomedan gentleman, Syed Abdoosuttah Sanien, of which 100 copies were distributed by this department, and the remainder by the publisher himself.

Of the Tamil copies, the first edition, comprising 300, was published by Parthasarthy Iyengar, B. A., for sale at cost price, and a second edition of 1,000 copies was subsequently published for gratuitous distribution by G. F. Fischer, Esq.,

the contractor of the Zemindary of Shevagunga, of which 500 were distributed by this department, and the remainder by the publisher himself.

Of the Telegu, the first edition of 1,000 copies was published by His Highness the Maharajah of Vizianagram for gratuitous distribution, of which 500 were distributed through this department, and the remainder was sent to D. F. Carmichael, Esq., for the same purpose.

A second edition of 300 copies in Telugu was published at the request of J. D. Robinson, Esq., Collector, for sale, at cost price, in the North Arcot District.

Of the Canarese, 1,000 copies have been published by John Macartney, Esq., the Agent to His Highness the Rajah of Soondoor; 200 copies of which were sent to Soondoor, and the remainder made available for gratuitous distribution in the Canarese-speaking districts of this Presidency.

Since, a number of the inhabitants of South Canara have subscribed for a second edition in Canarese, of 600 copies, through the exertions of Mr. Lawrence, the Deputy Superintendent of the Malabar Vaccine Circle, for distribution in that district, and for the bringing out of which arrangements are now being made.

Government had sanctioned the publishing of 300 copies of an Oorya translation of a treatise on vaccination, of which fifty copies only have been published, through the kindness of G. S. Forbes, Esq., the Collector of Ganjam, free of expense, at the Collectorate Press. The treatise in this language being much needed, arrangements will be made to bring out the edition complete, as soon as possible.

15. Thus it will be seen that 4,250 treatises, in five languages, have been published for distribution during the year under review, and every means are taken to give them as wide a circulation as possible; and I have reason to believe, if not in all, in most districts they have been appreciated, as frequent applications have been received for copies. Independent of the above, in some districts the Collectors were good enough to have these Lectures re-published in their District Gazettes, thus giving them a wider circulation, so that the merits of vaccination may be said to be fully before the people. Notwithstanding which, it will require time and perseverance for vaccination to be appreciated as it ought to be, for there are large portions of many districts

where vaccination has never been heard of, nor a Vaccinator seen. These parts are only now, for the first time, being systematically visited by this department, and the people urged to take advantage of so simple and beneficial an operation as vaccination. Nevertheless, village after village has been visited, more especially in the Cuddapah and Kurnool Districts, without being able to obtain a single subject for operation.

16. During the recess, I spent a month on the Shervaroy Hills, and vaccinated personally 349 subjects. I then proceeded to Coonoor and Ootacamund, where I examined and superintended the operations of six Vaccinators, whom I had ordered up to work at the Sanitarium. 2,527 operations were performed, chiefly among the Hill tribes; there were 384 failures, or 84.80 per cent. of success. At the same time I forwarded several supplies of lymph from Ootacamund, during the hot weather, to most of my Assistants, and to Dr. Balfour, Deputy Inspector-General of Hospitals, Hyderabad Subsidiary Force, for the use of the Hyderabad Contingent. On the 18th of June, the Vaccinators were sent back to join the head quarters of the Coimbatore Circle, as I was called to the Presidency on emergent duty, and had to proceed forthwith.

17. I have personally been over the greater part of this Presidency, and in addition to visiting the several localities in which my Assistants were at work, and passing a few days with each, I have visited every station of importance, either in the vicinity, or in the line of my travels, as well as most of the Zemindary estates in the remotest districts; the year under review closed while I was on my way to Jeypore, in the northern district; in every place urging strongly the merits of vaccination, and bringing the subject prominently before the people; and I am happy to say that, in consequence, several Zemindary estates, self-supporting Civil Dispensaries, and local Municipal Associations have been induced to employ their own Vaccinators, and at the close of the year there were forty-six Vaccinators so employed, and are now fully at work; but as most of the Zemindary estates are scattered, frequently located in remote and sickly districts, and for the most part occupied by semi-civilized tribes, the work languishes for the want of effective supervision; notwithstanding which, from this source alone 8,542 subjects have been operated on. It is true these numbers cannot be relied

on in the absence of effective superintendence, but the field is extremely promising, from the fact of the Vaccinators being servants of the proprietors themselves, the people at once submit to the operation; the very mention of the approval of the proprietor is sufficient to induce the people to have the operation performed, so that when provision for effective supervision is eventually made, very gratifying results may be anticipated from this source.

The Civil Dispensaries and Municipal Associations make their own arrangements for the supervision of Vaccinators employed by them.

18. The lymph in use at present throughout the Presidency is good and genuine, as proved by the resulting constitutional disturbances. A communication of lymph was made between this and Calcutta, that received from Calcutta was found good but no report has been received on the supply sent from this Presidency. There has been a constant interchange of lymph between the several circles and Vaccine Depot with decided benefit.

19. During the year under review, I conducted experiments with vaccine lymph and small-pox virus on most of the lower animals, with excellent results.

(a.) At the beginning of the year I had determined to carry out a series of experiments as opportunities offered, by passing the vaccine lymph in use through the cow, and re-transferring it to the human subject, and at the same time testing its efficacy in most of the domestic animals. Early in January I began a series of experiments, by vaccinating cows with lymph from the human subject, and after one or two failures eventually succeeded in transferring lymph from the vaccinated cattle to the human subject again, and to some of the lower animals, such as the sheep, goat, dog, donkey, fowl, &c., successfully. In the horned cattle the vesicles were good, and the lymph generally transferable from the fifth to the eighth day. In some animals the vesicles showed themselves with rather large flat brown scabs, and yielded little or no lymph. In others the scabs were somewhat smaller in size, the margins well raised, and filled with a supply of lymph. In the donkey, sheep, and goat, the vesicles were raised on a hard base, with small crusts or scabs, containing little or no lymph, but when the scab was removed and the raw surface scraped, the application of the secretion so procured from the sheep and goat, pro-

duced similar vesicles in other animals, in every successive transfer. In the dog, the vesicles were small and covered with a large brown thin scab, the supply of lymph was more abundant, and the disease was successfully transferred from one to another. In the fowl, a simple small warty concretion formed at the puncture, and neither contained nor yielded any secretion. These results were repeatedly verified. At my request two of my Assistants sent me small-pox virus, saturated in cotton wool, and some scabs, from Guntoor and Salem; these I put to the test in Madras and on the Shervaroys. At Madras, in one instance only, it succeeded, in the sheep, from scabs; pustules were raised similar to those of small-pox at the insertions; but at Yercaud on the Shervaroys, in the month of April, it failed altogether. Owing to the prejudice and ignorance of the natives, it was found most difficult to obtain fresh small-pox virus from the subject. All my Assistants were asked to embrace opportunities occurring of the prevalence of small-pox, so as to secure and forward the virus for further trial; but none was received till the end of October last. Whilst on a tour of inspection at Arcot, I found small-pox prevalent epidemically in the place, and the opportunity being favourable, I determined and carried out a course of experiments, in which I was assisted by Mr. Boalth, the Deputy Superintendent of the Salem Circle, an abstract of which I here insert.

(b.) In all there were four small-pox subjects, from whom virus was transferred to the following animals between the 31st October and 10th November 1866:—

Cattle—2 young Bulls, 3 Heifers and 1 Cow.

1 Pony.

2 Donkeys.

1 Dog.

1 Goat.

(c.) From these cattle, there were five successive transfers of the virus to human subjects; the total of subjects successively operated on was fifty; of these, six comprised the original transfer from the cattle direct, one from a goat, and the remaining forty-three were successive transfers from these subjects. Of the seven subjects originally operated on, one absconded; in two, the insertions showed the true characters of vaccination; and in the remaining four, although the insertions progressed favourably, and in

every respect resembled vaccination, small-pox eruptions shewed themselves subsequently, and became scattered over their persons—the number of these pustules varying in the subjects from 30 to 200. Of these four subjects, the subsequent small-pox eruptions made their appearance in three on the twelfth, and in one on the ninth day after the original insertion. The insertions themselves ran their ordinary course, as is usual in cases of vaccination. In every one of these cases the insertions consisted of six punctures, three in each arm; and in the two subjects who had been free from secondary eruptions, two only in each case vivified, and in both these instances, on the seventh day after original operation, a fresh re-insertion was made in the failed punctures from the same small-pox virus passed through the cow. Of the re-insertions in these cases, in the *first* case, one only vivified, a small papule showing itself on the ninth day from original, and third day after secondary operation. The papule formed a pustule on the eleventh day after first, and fifth day after secondary operation, and the original insertions, the two that succeeded had matured, and were now forming scabs. On the 21st November, or sixteen days after original, and ten days after secondary operation, the secondary pustule formed a small black spot, about the size of a large pin's head, whilst that of the original insertion, the scab of one had dropped off, but the other was still adherent. On the 25th November, or twenty days after original, and fourteen after secondary operation, the two remaining scabs dropped away, the former leaving behind a true vaccine cicatrix, and the latter a mere superficial minute scar on the arm. In the *second* case, the insertions were made on the seventh day, after first operation, from genuine vaccine lymph; the two original insertions in this case had vivified, and were now visible in the form of good vesicles. On the 15th November, or ten days after original, and four after secondary operation, the original insertions had matured, and were scabbing, whilst the vaccine re-insertions had formed minute pimples, containing a small quantity of pus—the patient had vomited and was suffering from nausea, high fever, pain in the axillæ, and general *malaise*.

16th November.—Original and secondary eruptions progressing. Vomited since last report. General constitutional symptoms are abating.

17th.—All the pustules have scabbed over, whilst the

vaccine scabs are very small; those from the small-pox virus resemble the usual vaccine scab in size.

20th.—Scabs drying.

25th—or twenty days after original, and fourteen after secondary operation, the scabs of all the insertions have come away, leaving good cicatrices on the original, and trifling scars on the secondary.

(d.) It will be seen, in both these cases, that the test known as "Bryce's," which consisted in the re-insertion of virus, as late as the seventh day, showed itself, and ran its course with the original operation, both in the case of small-pox and vaccine virus.

(e.) Lymph from these cases, charged in capillary tubes, and forwarded to Madras, succeeded well, and there were no secondary eruptions; whereas a third case, operated on at the same time and with the same virus as the above cases, on the twelfth day after the operation, some four or five papules were noticed on the face. On the 19th, there were from eight to ten small conical vesicles, containing a little limpid fluid. On the 21st, the whole surface of this boy was scattered over with eruptions, of which there must have been at least fifty or sixty in number. The eruptions which first shewed themselves, dried without suppurating. A few vesicles on the hand and lower extremity presented the characteristic appearance of small-pox, viz., the flat umbilicated look and raised margins. While some were hard to the feel, many acuminate, and others formed little bladder-like vesicles. The original insertions on the arm have increased in size, and are beginning to scab. On the 28th, or twenty-three days after operation, the scabs from the inoculated insertions dropped off; the secondary eruptions also scabbed, a few dropped off; whilst others passed through the regular pustular stage before scabbing.

(f.) In the second series of transfers, almost every case had secondary eruptions, varying in number from 50 to 300, generally appearing about the twelfth day, and having the same character as that just detailed, whilst the insertions themselves progressed satisfactorily like ordinary cases of vaccination. The bull operated on, on the 31st October, showed indications of tumefactions of the skin, and enlargement of the glands generally; and out of five animals, this was the only one in which the disease took this irregular form. I am inclined to attribute it to the excitement the

animal was under, the distance it had to travel over, crossing a river, a mile wide, and having to swim over several portions of it; these circumstances, perhaps, may account for the irregularity. At the same time the off-fore fetlock had a greasy appearance, and was moist with exudation, and irritated by flies, was covered with several bleeding points, this only showed itself with the tumefactions of the skin and subsided with them. In the goat also, although the insertion on the scrotum with small-pox virus shewed a distinct umbilicated vesicle, resembling genuine vaccination, still it was surrounded to the extent of two inches with a greasy moist exudation and peculiar musty odour; with this exception nothing else was to be found wrong with the animal. Matter transferred from this goat to the human subject, although the insertions ran the usual satisfactory progress, on the twelfth day secondary eruptions, to the extent of nearly 300, shewed themselves. The pony having been lost sight of, results were not observed. Of the two donkeys operated on, in one it failed altogether, and in the other the insertions only vivified, and ran their course satisfactorily. In the dog also the disease shewed itself at the insertions only, and when transferred to a second animal, the insertions only vivified and ran the usual course.

(g.) Thus it will be seen that in these lower animals, the insertion of small-pox virus takes on the ordinary character of vaccination, and is capable of being transferred to other domestic animals as a simple disease, or to the human being as cow-pox, and even in those cases where it took on the form of vaccinia, it must be considered a simple disease, when compared with small-pox. With regard to the secondary eruptions, I am prepared to shew that they were owing to the prevalence of epidemic small-pox in the station at the time, or resulting in what is termed vaccinia, simply variola modified by transmission through the cow. In one case (seventh day) vaccine matter was inserted at the failed insertions, and it vivified and progressed in the manner described by Bryce, terminating with the originally inserted virus; and in another instance, in a subsequent series of transfers, when on the fourth or fifth day there were no indications of the small-pox virus, passed through the cow, vivifying on the subject, re-insertion of genuine vaccine lymph caused the original insertions to vivify and run their course satisfactorily. It will also be observed that when the inoculated small-pox matter from the cow was sent to

Madras, where there was no small-pox epidemic prevalent at the time, genuine vaccine disease shewed itself, but when transferred to others at Arcot, where small-pox had been for some time and was then prevailing, vaccinia, or a modified form of small-pox, shewed itself between the ninth and twelfth days after inoculation, and only two subjects inoculated from small-pox matter direct from the cow, were free from vaccinia. In all the other original and subsequent transfers at Arcot, vaccinia followed; and in one instance, where the first insertion of small-pox matter from the cow shewed indications of failure, the insertion of genuine vaccine matter, as late as the seventh day after primary operation, caused the original small-pox insertions to vivify and run their regular course; this is an interesting feature in this case, as the secondary insertions only shewed minute pimple-like formations, and the cicatrices were also equally satisfactory.

(h.) Further, the view originally propounded by "Jenner," that cow-pox and grease in the horse were identical, is proved from the fact of grease shewing itself in the fetlock of the first bull operated on, and in the scrotum of the goat, and appears to me confirmatory of this view; however, further experiments are necessary to clear this point in a more satisfactory manner.

(i.) It will thus be seen that the transfer of small-pox matter from the human subject to cattle, goat, donkey, dog and sheep, was successful, and unmistakably so in those animals from which virus was re-transferred. From cattle and goat, the virus was successfully transferred to the human subject, but in the instance of the dog, the disease was simply transferred from one dog to another, and that successfully. So that these experiments prove the fact that this noxious disease (small-pox) can, by transfer to most of the domestic animals, be converted into a very simple disease, without in any way interfering with the general health of these brutes. The virus from these animals was transferred to the human subject, from the fourth to the ninth day, successively; these transfers, for the most part, being, whilst the disease in these animals was in a papular stage, the resulting disease from such transfer in the human subject, between the seventh and eighth days, was characteristic of vaccination. The constitutional symptoms, comprising fever and tenderness of the axillary and cervical glands, generally shewed themselves about the seventh day. What struck me

as remarkable was the scantiness and clearness of the lymph obtainable from these vesicles, the resulting cicatrices were equivalent to genuine vaccine vesicles.

(j.) To test the secondary eruptions that followed in most of the cases so operated on, one subject, suffering from the modified disease, was selected, and from the most promising vesicles, the virus was re-transferred to a calf directly; the operation proved successful. Matter was now taken from this calf on the seventh day, and transferred to two human subjects, and to a third on the eighth day. The two first cases failed, but the last one succeeded, with great constitutional disturbance, and on the twelfth day after the operation the usual eruptions shewed themselves, and were scattered over the whole body, having the same characters as those already described. The same results were obtained in the second and third series up to the sixth transfer, but in some few instances there were no secondary eruptions. Eighth day virus from the above calf was forwarded to the Vaccine Depôt, Madras, and there two children were operated on, resulting on the fifth day "high fever, with tenderness and swelling of the cervical and axillary glands," and the disease running its regular course, like ordinary vaccination, without any secondary eruptions following.

(k.)—On the sixth transfer, in two cases, one had modified small-pox, and the other escaped. On the seventh transfer from this subject, who took small-pox, to two fresh cases, one shewed modified eruptions, and the other escaped. The eighth transfer was made from the child who took the secondary eruption; prior to its appearing, the operation succeeded, but there were no eruptions. From this a ninth transfer was made to two fresh subjects, but in both the eruptions shewed themselves, and here terminated this course of experiments.

(l.)—The practical results deduced from these experiments are as follow:—Where a difficulty exists in conveying vaccine lymph in the subject, it might be conveniently done through the medium of some of our domestic animals, and although this might be effected by means of some of the animals enumerated in my experiments, I would, for the purpose of transferring lymph to the human subject, limit the practice to horned cattle only, with, I think, decided benefit to the animals as well as to the subject, by the activity and vigor of the disease being increased in passing through the cow.

(m).—Still I am of opinion that vaccination may possess a certain protective power over cattle, and if the co-operation of village officials can be secured, decided benefits would accrue by vaccinating animals in the villages where operations are being carried on, not only for testing the results, but for propagating lymph, and time will shew how far the operation has proved protective to cattle by keeping them, more especially in those districts where cattle disease is rife, under observation.

(n).—In an emergency, where small-pox breaks out epidemically, and no vaccine lymph is procurable, the virus from the disease can at once be made available by passing it through the cow, for transfer to the human subject, with decided benefit.

20. In 1866 there were distributed, to the several Mofussil stations from the Vaccine Depôt alone, 1,732 charges of lymph, namely, capillary tubes, 1,372; plates of glass, 203; ivory points, 126; crusts, 24; and lymph bottles, 7; in addition, several charges of lymph were sent to England, Sydney, and New South Wales. From Sydney the reply received was satisfactory. Mr. Thomas Hogg, of New-water, Five Docks, near Sydney, writes to say, "I got a little excellent lymph from one case that I vaccinated with one of your tubes, from which I vaccinated another this morning." No reply has been received from England. From the several circles 1,184 charges have been sent to other localities, thus giving a total of 2,916 charges in all. I have reason to believe that a large supply of the lymph so despatched has been successful. Lymph preserved in glass capillary tubes at the Vaccine Depôt on the 17th January 1866, was used on the 21st December, or, in other words, eleven months after, with success. From the want of Vaccinators in the chief civil and military stations, there is a constant demand for lymph, as no efforts are made to maintain a supply in these stations, but they seem to depend entirely upon supplies received from the Depôt or one of the circles, which entail a large disbursement of appliances.

21. Supplies of lymph have also been forwarded to Singapore and Burmah.

22. During the year under review, the ratio per cent. of

success to failure, on the total of operations in this Presidency, stands as follows :

Total number vaccinated.....	194,509
Do. successful.....	168,057
Ratio per cent. of success.....	86.38
Failure.....	13.62

The success of operations would have figured higher, were it not that all subjects, not personally inspected by the Deputy Superintendents, were entered as unsuccessful, so that the per-centage of failure appears greater than it really is.

23. Medical aid continues to be sought for eagerly by the people, from my Assistants, during their travels in the interior of districts, to which they have readily responded to the extent of the means at their disposal. During outbreaks of cholera in some districts, they were in a position to cheer the panic-stricken people who frequently fled from the place, leaving the dead and dying to be devoured by the village dogs and pigs, and in these instances the native officials themselves were the first to leave, and in every such instance my Assistants, with great presence of mind, not only visited the localities to afford such help as they could give, but at the same time reported promptly the state of affairs to the Collectors of districts.

24. In consequence of a severe outbreak of cholera at Kurnool in July, the services of the Deputy Superintendent, and Hospital Assistant of the circle, who happened to be working in the vicinity, were promptly placed at the disposal of the chief Medical Officer at Kurnool, and they were so employed from the 3rd to the 24th July. During my tours I not only visited every poor or relief-house in the stations I passed through, but my Assistants were also instructed to do the same, and, when possible, to vaccinate the unprotected, as frequently famine and disease stalk hand-in-hand together, and, as instanced at Ganjam, small-pox frequently follows in the wake of want. In a few relief houses only we were not allowed to vaccinate the poor who sought relief from, as it appears to me, a mistaken view of the subject; but in others, both myself and Assistants received every encouragement in carrying out the good work.

25. The medicine chest supplied to my Assistants I find, from personal observation, inadequate to meet the demands made on them; not only should they receive larger supplies of medicines, but the several Civil Dispensaries should be

directed to supply them with prepared medicines when emergent requisitions are made. In one instance two drachms of chloroform were not only denied when emergently asked for, but the competency of the Assistant to administer it was called into question.

26. The number of six insertions is now insisted on in every instance, where the staff belonging to this department operate, and I myself believe with decided benefit; and the manner of distinguishing the punctures in the sexes, as detailed in my last annual report, is practically carried out. My Assistants have been urged either in transferring or collecting lymph, to rupture as few of the vivified vesicles as possible, so that where there are six insertions, two; and where there are four, only one should be opened for lymph purposes, and where there are a smaller number of vesicles, in exceptional instances only should lymph be sought from such cases. Re-vaccination, after the manner of Bryce's test, is insisted on at the failed insertions any day between the fourth and eighth after operation, when possible, and certainly were carried out with success.

27. The needles are now in full play as a vaccinator, by the whole staff in this department, and, in my opinion, with decided advantage, and I think greater success as to the results of the operation. The whole of my Assistants, with one exception, were long in favour of this instrument. The Deputy Superintendent of the Malabar Vaccine Circle, in July last, wrote greatly against it, and suggested a re-introduction of the lancet. When the opinions of the other Assistants were given him, and a pattern instrument sent from this with instructions as to its use, in the annual report now received he speaks more favourably of it. I observe from the reports of my Assistants, that three of them believe the needle instrument causes greater pain; this does not accord with my own personal experience; of course much will depend upon the way in which it is used, but as a successful vaccinator and as a matter of economy, no better instrument can be found, and parents, as a rule, do not show that anxiety and alarm regarding the operation itself which formerly was the case when lancets were in use.

28. The cost of a lancet, I find, is Rupees 1-3-3, with the usual per-centage added to it. The Medical Examiner in his letter, No. 1074, of 5th January 1867, states, that during the last five years 2,582 lancets in all were disbursed at an

expense of Rupees 2,123-15-5. At an average there were 516 lancets purchased at a cost of Rupees 433-15-7 annually, presuming that the whole of the lancets so received, were for the use of the department. The needles in use at present cost six pie each, and, as a rule, the Vaccinators find them. In exceptional instances, where any difficulty exists in obtaining them, they are supplied. The question of the needles as a vaccinator having been satisfactorily determined, no lancets will be required for the use of this department for the future.

29. The table shewing the number of boys vaccinated, unvaccinated, and small-pox marked, and the proportion per cent. respectively in Government schools under the Presidency of Fort St. George, for 1865, received from the Director of Public Instruction, shewed so small a percentage of unprotected, namely, 16.30 in the whole Presidency, that it did not tally with my personal experience in the matter. I suggested, through the Principal Inspector General, that the services of Medical Officers and Subordinates should be taken advantage of in drawing up such Returns, as natives are in the habit of pointing out any little scar and attributing it to small-pox or vaccination, that non-medical persons are easily misled, and although, according to the letter of the Director of Public Instruction accompanying the Return for 1866, my suggestion of employing Medical men for examining the boys in drawing up such tables, has not wholly been taken advantage of, yet a larger number of unprotected persons is shewn, for there is a great difference between 16.30 and 24.69; this percentage will still become larger, I believe, when my suggestion comes fully into operation.

30. It is indeed a matter of extreme regret that, under Government protection, so large a proportion of boys educated in its schools should evade vaccination, and leave not only themselves, but through them others, exposed to attacks of so deadly a disease as small-pox, and be the means of propagating it throughout the country.

31. I will here review the reports of my Assistants.

NO. 1, OR MADRAS CIRCLE.

There is a large decrease, extending over two thousand operations, in this circle, during the year reviewed. I do not

agree with the reasons assigned by the Deputy Superintendent, for I am certain when the population of Madras is taken into consideration, a large proportion must be unprotected; to this must be added the annual increase by new births. The adverse season was against vaccination at the Presidency, for people were averse to subject either themselves or their children to the operation when want was staring them in the face, whilst the usual apathy and indifference prevailed among others. To this must be added the change of Superintendents and staff; there were two among the former, and six among the latter. The more experienced Vaccinators had to be moved to the Mofussil, and young men entering the department had to take the place of experienced hands.

I inspected the work of the staff of the circle at Royapuram on the 23rd, and at Perambore on the 27th July 1866, in company with the Deputy Superintendent, when I examined a large number of subjects who had undergone the operation, and others who were then submitted to it, in my presence, and was satisfied with what I saw of the work generally.

The Vaccinators are kept constantly on the move over every part of Madras, and the subject of vaccination is constantly brought before the people in every possible way.

The number of children submitted to the operation under one year of age was 1,134, with 1,039 successful and 45 unsuccessful. Rupees 58-6-6 were distributed as batta to mothers for supplying lymph subjects during the year.

The total number of operations for the year was 4,767 with a percentage of 92.97 of success.

VACCINE DEPOT.

At this Institution there has been a small increase over that of the previous year; it might have been very much larger, had it not been for the scarcity (and dearth) of rice, which was sold at famine prices, and the amount to be so expended in the purchase of rice had to be limited to a monthly expenditure of 166 Rupees, so as to be able to keep within the Budget estimate for the year—consequently, the more promising cases only had to be selected for operation, out of those who presented themselves at the Depot, so that fifteen hundred and twenty maricals and six seers of rice were expended, at a money value of Rupees 1,915-8-9.

The demand for vaccine lymph from this Institution is daily on the increase; in all 1,732 charges were sent out, being 1,260 over that of the previous year. The lymph in use is excellent, and has been greatly improved, and exhibits greater vigor since its transmission through the cow. I pay the usual weekly visits to the Dépôt, and my best thanks are due to Dr. Porteous, the Deputy Inspector General of Hospitals, who visits the place occasionally, and takes great interest in the work.

A large number of applicants were furnished with the usual vaccine certificates at this Institution, preparatory to undergoing the several examinations.

I am happy to state that the entire building, known as the Chintadrepettah Dispensary, was made over to the Vaccine Dépôt on the 1st November last, and the building being commodious, offers ample room for store, office, and reception rooms, but I regret to say that the entire building is sadly out of repair, and requires immediate attention.

Since the building has been converted into a Vaccine Dépôt, I have been able to arrange temporarily for the separation of the cases presenting themselves for inspection after operation, as well as those coming in for the first time to undergo the operation, without confusion, which is a great boon to mothers bringing in young children, and who are frequently accompanied by others. Permanent rails will have to be erected to confirm this plan of operations, and I would here draw attention to the remarks of the Deputy Superintendent, as to the rickety state of the building generally.

The total number of operations for the year was 4,627, with a per-centage of 90.27 of success.

NO. 2, OR COIMBATORE CIRCLE.

I have been enabled to visit the staff of this circle twice during the past year. On the first occasion I joined my Assistant at the end of March in the Coimbatore District, at the village of Seeloor, where the Deputy Superintendent had established head quarters, and stayed four days in the locality, visiting several villages in the vicinity, and operating on large numbers of the people; frequently mothers submitted not only their children, but themselves to the operation cheerfully. A second visit was paid, whilst the

staff of the circle were at work in the Trichinopoly District, at the village of Teeromullavadee, where I inspected them, and examined the lymph in use on the 18th September 1866. I was much pleased with all that I saw; the Deputy Superintendent, Mr. Karney, was very zealous and exerted himself greatly, so that I was by no means surprised to find Mr. Karney take the lead in having executed the largest amount of work in the whole department. 28,373 operations were performed by himself and staff during the year, being an increase of 9,157 over that of the previous year, with a success of 87.69 per cent., and 4,709 subjects were infants under a year old.

My thanks are due to Mr. Karney not only for the exertions he has made to shew the largest number of operations, but for the correctness and punctuality with which his Reports and Returns are generally sent in. The sum of Rupees 53-9-0 has been paid to mothers for supplying lymph during the year under review, and I would especially draw attention to Mr. Karney's report, which is not only clear and complete, but well written.

NO. 3, OR MALABAR CIRCLE.

The staff of the Malabar Circle I visited at Paulghaut on the 20th March 1866, where I spent five days in visiting some of the outlying villages, at distances varying from five to fifteen miles, inspecting the past and seeing fresh work executed in my presence, encouraging the people to come forward and undergo the operation. I found the lymph in use good, and the work satisfactory. The Deputy Superintendent shows 17,445 as the total of his operations during the year, giving an increase of 2,511 over the previous year, with a success of 85.93 per cent.

Much objection to vaccination exists in the Western Coast Districts, and a great deal of time is lost in house-to-house visiting, where they are not close together like most other districts, but are scattered far apart. Nevertheless, Mr. Lawrence and staff have been making creditable exertions in a district where much bigotry and religious fanaticism exist as regards vaccination, in endeavouring to overcome the same successfully. Small-pox, I believe, is constantly present in many parts of the Western Coast. Mr. Lawrence acknowledges much assistance from the Roman Catholic Priests in the Mangalore District, in not only urging

their own, but others, not of their persuasion, successfully, to undergo the operation. An interesting account is also given of how small-pox was conveyed from Mangalore to a couple of villages, where the disease prevailed extensively in an epidemic form.

The sum of Rupees 29-14-5 was paid as batta to mothers supplying vaccine lymph. 864 children, under one year of age, were operated on in this circle during the past year.

No. 4, OR MADURA CIRCLE.

I visited this circle in August last at Madura, where I spent a week, and accompanied the staff around the town and adjacent villages during my stay, inspecting the lymph, and having a large number of subjects operated on in my presence. I was not satisfied with either the work or the manner in which it was being conducted; the movements of the Deputy Superintendent were always slow and behind time. The total of operations in this circle was 17,612, showing a large decrease of 4,604. Although I had much fault to find, still in justice to Mr. Osman, the Deputy Superintendent, it must be said that the adverse season, and the presence of cholera in a virulent form in the circle, tended to circumscribe his sphere of operations for a time greatly and reduce his numbers. Since, Mr. Osman has made great exertions to retrieve lost ground, with some success, but I still have to complain of a want of punctuality and care in the despatch of Reports and Returns.

The per-centage of success is 89.01, and 2,946 subjects, under one year, were operated on.

Rupees 30-8-0 were expended as batta.

No. 5, OR TANJORE CIRCLE.

I joined the staff of this circle on the 25th September last, at the village of Kordachary, in the Tanjore District, where I passed five days, visiting most of the adjacent villages, seeing and operating on subjects and examining the lymph in use, and was much pleased with the neatness and correctness in which the records were kept, and the uniformity and care evinced for the preservation of the Vaccinator's equipments.

The total of operations in this circle, for the year under review, was 22,405, giving a large increase of 10,730 over

that of the preceding year, with 87.54 per cent. of success; and of the number vaccinated, 3,544 were under one year of age.

I have much pleasure in acknowledging Mr. Donaldson's exertions in the department.

Only one Rupee was expended as batta.

No. 6, OR NORTH ARCOT CIRCLE.

I joined the staff of this circle at Kalastry, in the North Arcot District, on the 29th November last, and spent two days in inspecting and seeing the staff operate, and visiting some of the adjacent villages.

The total of operations in this circle was 14,736, with an increase of 6,732 over that of the previous year, giving 93.45 per cent. of success; and of the total operations there were 1,249 under one year of age.

I had some fault to find in this circle, more especially as regards the mode of operation; notwithstanding which, I am happy to say that Mr. Kinsley, the Deputy Superintendent, has been exerting himself satisfactorily in the discharge of his work, and during the first half-year he was temporarily in charge of the Madras Circle and Vaccine Depôt, in addition to his own circle, which he had to supervise, and I have had every reason to be satisfied with the manner in which he acquitted himself.

Only eight Annas were expended as batta.

No. 7, OR SALEM CIRCLE.

The staff of this circle I first visited on the 25th October last, and spent a fortnight with them. Subsequently I was constantly backwards and forwards, and in personal communication with the Deputy Superintendent throughout November and the early part of December, in consequence of some small-pox experiments I carried out at Arcot, where the Deputy Superintendent had his head quarters.

The total of operations for the year under review was 17,034, with a small increase of 135 over that of the previous year, and a per-centage of success of 88.14. 3,326 children, under one year of age, were operated on.

Rupees 36-7-3 were paid as batta.

No. 8, OR BELLARY CIRCLE.

The head quarters of this circle were established at Ghooty, when I joined them on the 22nd November 1866. I spent three days with them in inspecting the staff, examining the lymph in use, and seeing the Vaccinators operate.

The total of operations in this circle for the year was 18,864, with an increase of 9,560 over the previous year, and giving a success of 83.35 per cent.

This circle suffered severely from famine and disease; had it not been for such troubles, I am confident the results would have been much greater. I had every reason to be satisfied with the manner in which Mr. Mayley, the Deputy Superintendent, conducted his duties, and I regret that he was obliged to resign his appointment in the department in consequence of indifferent health.

7,199 subjects, under one year of age, were vaccinated.

One Rupee was expended as batta.

No. 9, OR CUDDAPAH CIRCLE.

The staff of this circle had just arrived at the village of Peapully, in the Kurnool District, when I joined them there. I passed two days with them in examining and executing operations, which were carried out in my presence by the Vaccinators.

The total of operations for the year was 5,519, shewing a large decrease of 4,949, with a success of 90.86 per cent. The deficiency can in no way be laid against the staff, for they exerted themselves greatly, and were constantly on the move, visiting some of the remote villages in the Kurnool District. No Vaccinators had ever been in these parts before, and the people knew nothing of vaccination, persistently refusing to submit either themselves or their children to the operation; and to add to their trials, cholera prevailed in the greater part of this district, and the pressure of want was also felt to some extent from failure of the seasons. From these combined causes arise the smallness of work executed in this circle.

Rupees 15 were expended as batta.

No. 10, OR KISTNA CIRCLE.

The staff of this circle were at work in the village of

Pallampett, in the Cuddapah District, when I overtook them on the 17th November 1866, and spent five days in examining and witnessing the staff operate, visiting several villages in the vicinity.

The total of operations in this circle for the year was 7,159, being a deficiency of 3,356 below that of the previous year, and giving a per-centage of 85.26. In this instance also the paucity of numbers cannot be attributed to the want of exertions on the part of the staff, though, during my visit, it appeared to me the staff were not sufficiently persuasive in trying to overcome the prejudices of the people, and in extenuation, it must be said the majority of the Vaccinators were new to the work, as several of the old and more experienced hands resigned the moment the head quarters moved from the Kistna to parts of the Nellore and Cuddapah districts, forming part of the circle, and others were dismissed for misconduct. The greatest number of changes among the Vaccinators occurred in this and the Cuddapah Circles. At the same time cholera prevailed greatly in the localities where the staff were at work, and the people fled from the place panic-stricken, leaving the dead and dying uncared for, and the staff were unable to move out of the infected locality from want of carriage; these causes, and the prevalence of small-pox inoculation satisfactorily account for the deficiency.

Rupees 15 were expended as batta.

No. 11, OR GODAVERY CIRCLE.

I joined the staff of this circle on the 19th December 1866, at Vizagapatam, and continued four days with them, examining them and seeing them execute their work.

The Deputy Superintendent gives a total of 6,148 operations for the year, shewing an increase of 2,642 above that of the previous year, with a per-centage of 80.93 of success.

Although much prejudice against vaccination exists in this circle, in consequence of the prevalence of small-pox inoculation, yet the numbers might have been larger, had not a great part of the time of the Deputy Superintendent been taken up with the inspection of the Zemindary Vaccinators of the Vizagapatam District, who are located far apart, and it takes several days travelling to reach some of them.

Eight Annas were expended as batta.

32. From a general review of the vaccine operations of the several circles, the largest number of operations as to total was in the Coimbatore Circle, whilst the largest number of operations for the year was effected in the Tanjore Circle, and the smallest amount of work was done in the Cuddapah Circle; whilst the greatest per-centage of successful operations was effected in the North Arcot Circle, and the smallest amount of success occurred in the Godavery Circle.

33. The largest amount of batta to mothers, for supplying vaccine lymph, was paid at the Presidency, viz., Rupees 58-6-6. In the Mofussil, the sum of Rupees 53-9-0 was the highest paid; in some two or three circles one Rupee, or eight Annas were all that was needed. Batta is only given in particular instances, and under the present plan of operations it is not needed in some, whilst in other districts nothing can be done without such encouragement. The total amount spent during the year, for procuring vaccine lymph, throughout the Presidency, was Rupees 211-14-9.

34. I submit extracts from most of the reports of my Assistants, at some length, as they give their experience in the several districts, after a year's fair trial, and although they slightly differ in their views as regards the spread of vaccination, still they contain much valuable and interesting information on the subject.

35. The greatest obstacle to the spread of vaccination exists in parts of the Coimbatore, Malabar, Tanjore, and Godavery Circles, whilst to some extent it exists in parts of almost all the circles, being in some more, in others less; further, small-pox has been prevalent throughout the year, either in a sporadic or epidemic form, in almost every district; its prevalence caused by the prevalence of small-pox inoculation, and the going about of individuals suffering from the disease ere quite well, and frequently carrying about their persons the same filthy rags which they used when ill; thus the contagion is spread far and wide, and continues in constant operation.

36. If the spread of small-pox inoculation had to depend simply, like vaccination, on the choice of the people, I should have no fear as to the eventual results, but unfortunately no such choice is left. But men of the highest caste (Brahmins chiefly) make it a living, and it is their interest to persuade the people to prefer small-pox inoculation by every means in their power, and to

succeed, they have but to establish or create a single case in a village, which is sufficient to enable them to frighten the people into acquiescence, and, as I have personally ascertained, the presence of the disease alone induces them to submit to inoculation.

37. Owing to the difference of opinion as to whether Section 269 of the Penal Code was applicable to the punishment of inoculators, I urged the question, and the Government were pleased to obtain the opinion of their Law Officers on the subject, and it was with regret I learnt that it was NOT, since a reference to the Supreme Government was obtained to this effect:—

“I am directed to acknowledge the receipt of your letter, No. 1760, dated the 7th ultimo, forwarding copies of papers having reference to the conflicting views entertained by the Magistrates of two districts on the question, as to whether small-pox inoculation was an offence punishable by law.

“2. In reply, I am directed to state that the Government of India concurs in the opinion of the learned Advocate General, forwarded with your letter, that inoculation, if done in good faith, is not punishable under the Penal Code.”

38. Alas! under such circumstances, what hope is there of that deadly disease, small-pox, becoming extinguished? In enlightened England, with all her resources of science and art, and where vaccination is rendered compulsory, small-pox can scarcely be kept down; but in unfortunate India, with an ignorant and superstitious people, wedded to superstition, filth, and disease, full play is given to small-pox inoculation! What hope, then, is there of being able to combat or control so fatal a disease as small-pox?

39. How pernicious the old system was, is now being brought to light by the exertions of my Assistants. The Vaccinators employed by Government, when beyond the ken of their superiors, practised inoculation instead of vaccination, and can it be believed that, in this the nineteenth century, there is no law to punish such delinquency! Why boast of our civilization in India? When brutes are cared for, and carefully protected by legislation, *Man*, created in the image of His Maker, and in the possession of an immortal soul, should be allowed to die by the thousand, to satisfy the cupidity of a few avaricious and bigoted individuals! I draw attention to the

reports of the Superintendents of the Malabar and Kistna Vaccine Circles, as to the practice that was in existence under the name of vaccination.

40. The chief delinquencies among the staffs of Vaccinators occurred in the numerical order below given in the several circles—

Nos. 10, 9, 2, and 4.

In the remaining circles little or no trouble was caused, whilst some Deputy Superintendents manage to keep their staffs well in hand, and work them amicably and well; others are constantly at fault, and sometimes the most trifling failings of their staffs are met with unnecessarily harsh treatment; this has to be borne in mind when representations of misconduct are received at this office.

41. As to the frivolous objections raised to the practice and spread of vaccination, and the absurd reasons assigned, as detailed in the report of the Deputy Superintendent of the Salem Circle, to which I would draw attention, I am capable of verifying. The fact is, that in most places, even where vaccination is acceptable, the people wish to make it suit their convenience in submitting to the operation, forgetful that the operators, frequently, cannot maintain a supply of lymph for any time in small villages, nor does it suit the present system of work to allow of Vaccinators dancing attendance on a few, to the neglect of thousands, to suit their prejudice and bigotry.

42. From the reports of the Deputy Superintendents it will be seen that one and all complain of the want of assistance from the village officials. It has been my practice, and I have endeavoured to inculcate the same in my Assistants, that these officials should generally be avoided, and I think with better success, as regards the success of operation; but there are circumstances which make it imperative that such assistance should be sought. Where it is cheerfully given, the success is certainly great; but when withheld, failure is equally certain; and no persuasion of the Deputy Superintendent and staff will secure a single subject, when the village officials, either openly or covertly, set their faces against the practice. In some districts the Collectors have issued stringent orders in the District Gazettes; foremost among these stand D. F. Carmichael, Esq., the Collector of Vizagapatam, who has evinced the greatest interest in the spread of vaccination, and has not only given very material aid

to the Deputy Superintendent, but it is to Mr. Carmichael's exertions that I am indebted for the large staff of Zemin-dary Vaccinators employed in that district, and I am further indebted to Mr. Carmichael for being the first to set the laudable example of employing Municipal Vaccinators.

43. It will be further seen from the reports that much stress is laid on the employment of caste-men as Vaccinators. I have long had this subject under consideration, and find that difficulties exist on both sides; when procurable, they are deficient in the requisite qualifications. It is true that Brahmins and other Hindus of high caste are more successful in operating on their own communities, whilst in this respect I don't believe they attain greater success than what Europeans or East Indians would in a similar position. Therefore, in the selection of caste-men, much care is necessary. Most of them refuse to operate on the lower classes, and thus the advantage gained, if any, is lost by their refusal to operate indiscriminately on all castes. Under these circumstances, it would be advisable to employ a few of each caste, and judiciously distribute them over the several circles.

JOHN SHORTT, M.D., SURGEON,

Genl. Supt. of Vaccination.

MILITARY CANTONMENTS.

There are three Military stations in which Vaccinators are located by this department; these comprise Bangalore, Secunderabad, and Kamptee.

1. BANGALORE.

Two Vaccinators are placed in this station, one an Hospital Assistant, and the other a temporary Vaccinator, for keeping up vaccination in the bazaars and pacherries within municipal limits, and for vaccinating or supplying, as the case may be, vaccine lymph to the several European and Native Hospitals in the place. These Vaccinators make their reports and receive their orders from the Deputy Superintendent of the Madras Circle.

I visited Bangalore in January 1866, and spent four days in examining the work of the two Vaccinators, which proved very unsatisfactory, on which these men were removed, and an Hospital Assistant and another Vaccinator took their place.

Subsequently the Deputy Superintendent of the Salem Circle was directed to pay monthly visits during the recess period, and inspect their work. The total number of operations of both these Vaccinators was 1,835, with a per-centage of 86.80 of success.

In November last, Hospital Assistant Goolum Nubby was removed from Bangalore to Soondoor, and he was succeeded by Hospital Assistant Sunjeevee, who continues in charge.

2. SECUNDERABAD.

Two Vaccinators are placed in this Military cantonment, under the orders of the Staff Surgeon, and the Vaccine Returns reach this office through the Principal Inspector General Medical Department. Surgeon Walter, in his report to the Deputy Inspector General of Hospitals, Hyderabad Subsidiary Force, states, "I have the honor to forward the enclosed annual Return of Vaccination for this station. Having so lately assumed charge of the department, I am not in a position to give an opinion as to the efficacy or otherwise of the two Vaccinators employed. The Return shews a falling off of one hundred and four in the number of European and East Indian male infants vaccinated, and of twenty-four female infants. Of one hundred and twelve male infants, Hindus, the female infants of the same class differ by one only from the number last year. The number of Mahomedan male infants vaccinated has increased by fifty, and of female infants by nine. The grand total of male infants vaccinated has fallen off by one hundred and sixty-six, and of females sixteen. It is satisfactory to note that, notwithstanding the falling off in the number of operations, the successful results have increased during the year by one hundred and twenty-two; the ratio of successful cases having increased from seventy to eighty-two per cent. In those above one year of age, there has been a falling off of ten in the European and East Indian males, with an increase of four in the females of the same class; an increase of two hundred and forty-four Hindu males, and a decrease of sixty-five females; a decrease of twenty-five male Mahomedans and twenty-nine females, amounting to an increase on the grand total of 209 males, but a decrease of ninety females. The results of the operation have not been so satisfactory as in the younger subjects, or as compared with those of last year; the ratio

of successful cases being only sixty-three against seventy in 1865."

3. KAMPTEE.

At this Military station there is only one Vaccinator, and the Returns also reach this office through the Principal Inspector General Medical Department. No report of the work has been received, but the Returns shew 996 operations for the year, of which 911 were successful, and 85 unsuccessful, giving a per-centage of 91.46 of success.

ZEMINDARIES. &c.

NORTH ARCOT DISTRICT.

POONGANOOR.

In this estate a Vaccinator has been employed during the year, his work I found good when inspected by me on the 10th December 1866; but it was unusually small, so that I had the Vaccinator's salary reduced for three months.

The total of his operations for the year was 438, with a per-centage of 96.80 of success. Of the number operated, sixty-three were under one year of age.

MADURA DISTRICT.

1. SHEVAGUNGA.

This estate had only one Vaccinator working in the earlier part of the year, but during my inspection in September last, I succeeded in urging on the contractor not only to increase the number of Vaccinators from one to three, but also to give them increased salaries, and place them entirely under the control of the Deputy Superintendent of the Madura Circle; this has been done, and the work is progressing satisfactorily. The number operated on during the past year was 2,727, of which 2,589 were successful and 138 unsuccessful, giving a per-centage of 94.93 of success.

These Vaccinators were inspected by the Deputy Superintendent twice during the year.

2. RAMNAD.

This estate has only one Vaccinator. His work, when examined by the Deputy Superintendent in April 1866, and by myself in September last, was found to be satisfactory,

the total for the year being 853, of which 842 were successful, and 11 unsuccessful, giving a per-centage of 98·71 of success.

BELLARY DISTRICT.

SOONDOOR.

On this estate an Hospital Assistant has been at work throughout the year as Vaccinator. I have not been able to inspect his work, but as it is conducted under the supervision of the Agent, John Macartney, Esq., who countersigns his Returns, the work can be relied on.

The total of operations for the year was 634, of which 531 were successful and 103 unsuccessful, giving a per-centage of 83·75 of success.

VIZAGAPATAM DISTRICT.

By the several Proprietary estates in this district, twenty-seven Vaccinators are employed; these are greatly scattered and are located far apart, and from the want of effective superintendence the work has been anything but satisfactory. The arrangements have been improved, and when special Superintendents are sanctioned, very satisfactory work may be anticipated.

The total for the past year is 3,529, of which 3,029 are reported successful and 500 unsuccessful, giving a per-centage of 85·83 of success.

Most of these estates I visited in December last, and had the idle turned out, and others of better promise put in their places.

GODAVERY DISTRICT.

There are four estates that employ five Vaccinators; here the work has been unsatisfactory, and the Returns of the Pittapur estate only have been received as yet. The two Vaccinators employed, give a total of 261 operations, with 245 successful and 16 unsuccessful, with a percentage of 93·86 of success.

RAILWAY.

In consequence of an outbreak of small-pox at Beypore,

I suggested, and Dr. vanSomeren, the Consulting Physician to the Railway, readily agreed to the proposal, that the Apothecaries employed by the Company should take up vaccination in their several stations on the South West Line, and the work came into play in March last, since which the total of operations was 270, of which 159 were successful and 111 unsuccessful, giving a per-centage of 55·18 of success.

My thanks are due to Dr. vanSomeren for having so readily and kindly acceded to my request.

CIVIL DISPENSARIES.

1. NEGAPATAM.

This Institution was the first to set the example of employing a Vaccinator at the expense of the Dispensary funds, for which I am greatly indebted to A. R. Hutchins, Esq., Sub-Collector of Tanjore, and President of the Civil Dispensary Committee. The Vaccinator was employed in October last, and the number vaccinated was 399, of which 343 were successful and 56 unsuccessful, giving a per-centage of 85·96 of success.

2. MANARGUDI.

In this station, during my visit in September last, I urged on the Manager of the self-supporting Dispensary, the necessity of employing a Vaccinator in connection with the Institution. My efforts were ably supported by the Native Surgeon, P. S. Mootoosawmy Moodelly, and a Vaccinator was soon after employed, who began his work on the 1st October, shewing 350 operations during the last quarter of the year, with a per-centage of 85·14 of success.

3. GUDDALORE.

Here also I succeeded in urging on the President and Medical Officer of the Civil Dispensary the necessity of employing a Vaccinator. Dr. Bilderbeck, the Civil Surgeon, having backed my efforts, one was employed, who commenced operations in November, giving a total of 62 for two months, and a per-centage of 85·48 of success.

4. COMBACONUM.

About the same time I visited this station, and saw the President and some of the Members of the Committee of Management, and urged the employment of a Vaccinator.

One was entertained in November, who reports 32 operations, with a per-centage of 95.75 of success.

5. RANEEPETT.

At this station the Rev. Dr. S. D. Scudder has been keeping up vaccination in connection with the Dispensary, and his Return shews 70 operations, with a success of 90 per cent.

LOCAL MUNICIPALITIES.

1. VIZAGAPATAM.

At this station the Local Municipal Association was the first in the Presidency to set the example of employing two Vaccinators. This was brought about by the kindness of the President, D. F. Carmichael, Esq., who takes much interest in the subject of vaccination. No Returns have been received.

2. BIMPATAM.

In this station also, through the kindness of the President, one Vaccinator has been employed, who has been two months at work, and reports 26 operations, giving a success of 84.61 per cent.

3. CUDDAPAH.

Here also the local Municipality has employed a Vaccinator, who reports for two months' work 41 operations, with a per-centage of 77.77 of success.

ART. XI.—On the *Curcuma longa* or Long-rooted Turmeric as a Prophylactic in Fevers. By Surgeon JOHN SHORTT, M.D., F.L.S., Superintendent General of Vaccination, Madras Presidency.

THE Turmeric, sometimes popularly termed *Saffron*, is too well known in almost every household in India, from its constituting one of the chief ingredients in *curries*. With the natives it forms the panacea to every "ill flesh is heir to," for not only is it used as a condiment in *curries*, but to native women it forms their chief cosmetic, and enters

largely into almost every ceremony, religious and secular, connected with the Natives of all parts of India. It also constitutes their chief domestic medicine, to which they resort in most cases of sickness, wounds, bruises, ulcers, &c.; in this respect the Mahomedan is just as partial to the Turmeric as the Hindu.*

The *Curcuma longa*, or root-stalk of the long turmeric, is perennial with elongated and branched corms and numerous root fibres. Its name was originally derived from the Persian of *Kurkoom*, it is called *Munjai* in *Tamil*, *Pasooopoo* in *Telugu*, and *Huldee* in *Hindustani*: of it there are many varieties having round or long corms, it is cultivated in most parts of India. It belongs to the natural order *Zingiberaceae*, and grows with broad lanceolate leaves with elongated sheathing petioles of a uniform green, producing bulbs, the scape formed in the midst of the leaves, is short and spiked with imbricated bracts, flowers large, whitish, with a slightly yellowish tinge, and a greenish tuft. The inner parts of the bulb are of a deep orange color; when dried it is more or less oblong, rough, of a yellowish grey color externally, and of a deep bright yellow internally, having a bitterish and somewhat acrid taste, and an aromatic smell. As already noticed, it is used by all classes in the manufacture of *curries*, and is also largely employed in dyeing, principally silks, but the color is fugitive. There is scarcely a Hindu ceremony, whether social, ceremonial or religious, in which it does not enter; mixed with *chunam* or quicklime and water, it forms the liquid in universal use for removing the "Evil Eye" in the ceremony termed "*Aruti*," which is in use on all occasions of religious or festive ceremonies. As a cosmetic the women employ it largely, in smearing their faces, arms, and legs; and among some, the whole body is smeared with a ground paste of the dried corm prior to bathing. It is in every-day use among Brahmins and others, and is believed not only to act as a detergent, but to tend to soften the skin and impart to it a yellowish tinge, thus relieving to some extent the dark colour of the skin. There is scarcely a Hindu, no matter of what creed or caste who would attempt to wear a new cloth for the first time, without staining the corners with turmeric paste; this practice is universal amongst men and women, as the absence of this stain would, it is believed, lead to misfortune, or prove the precursor of some evil.

Its medicinal properties are chiefly aromatic, stimulative,

detergent, cordial and stomachic. It is in high repute as a detergent, and partial antiseptic, and is in consequence largely used to free foul ulcers from offensive matter and to correct and improve their condition; in fact, it is, as already stated, the panacea for all wounds, bruises and other injuries, no matter how inflicted. The first remedy sought for and applied in such cases by all classes of natives is the turmeric paste, and it certainly reduces the swelling of parts, promotes absorption and removes ecchymosis, and where the skin is broken it tends to heal it. During attacks of small-pox it is ground into a paste and applied to the eruption in all its stages—this practice is also carried out in vaccination. Native mothers do not give cases after vaccination any attention, but simply daub a mass of the ground turmeric and *neem* leaves on to the vesicles: As this paste dries, it forms a scab, shrinks, cracks and falls off, leaving the insertions in a state of open ulceration; thus doing more harm than good when applied after vaccination.

In severe colds and stuffing of the nostrils, the dried corm is lighted at one end, and the smoke issuing from the burning mass is inhaled, with decided relief.

In severe seizures of cold in the head, about half a tea-spoonful of the powder is thrown into a cup of warm milk and drunk for several mornings, which is said to relieve it. It is also said to be useful in slight catarrhal and bronchial affections.

In cases of serious illness, offerings of money are made—a silver or copper coin, according to the wealth of the parties, is wrapped in a piece of cloth, steeped in a solution of turmeric, and tied around the arm of the patient, which it is supposed charms away all evil influence, and heals the sick. On recovery, the coin is given to the poor, or laid out in the purchase of flowers, &c. as an offering to some deity. I have also seen it used to relieve the burning of the eye in Ophthalmia, a decoction of turmeric, being applied to the eye cold, on a piece of linen, with advantage.

These are some of the uses to which turmeric has been put by natives generally, for years past, but when in the *Jeypore Province* the other day, I was surprised to find that most of the people went about in yellow cloths (dyed with turmeric.) This I occasionally witnessed in other districts, but here it was general. On enquiry I found that it was done as a protection against fever. The province of Jeypore is noted

for its deadly fever, and from it new comers, or people from the low country invariably suffer, whilst the natives of the place itself do not entirely escape its ravages; and it is said that all those who use the turmeric freely, and make use of cloths dyed with a solution of it, never take the fever, and that this fact is well known in most of our hill provinces. How far this is really the case I am unable to state, as my stay at Jeypore was very short, and I had not the means of testing the fact. There is a great tendency to splenic disease arising from malarial causes in Jeypore, and I found a large number of the natives of the place as well as those from the plains suffering more or less from splenic enlargement and other cachectic appearances indicative of a debilitated state of health, but in those instances where the turmeric was freely used either as a cosmetic, an article of diet, or the cloths in every-day use stained with a solution of it freely, I did not find a single case of deteriorated health; under these circumstances, I simply beg to draw attention to the fact as deserving of further observation and experiment.

Although the turmeric finds a place in our *Materia Medica* and *Pharmacopœia* as a curative agent, its use seems to have been long exploded from practice, and the only official use now made of it is perhaps that of furnishing turmeric paper, used in chemical laboratories for testing the presence of alkalies.

ART. XII.—Report upon the Topography, &c., of Kurnool, with reference to the occurrence of Epidemic Cholera.

By C. A. ANDREWS, Civil Surgeon, Kurnool.

(Communicated by the Inspector General Indian Medical Department.)

Topography.—The town of Kurnool is built upon a point of land formed by the junction of the Hindry with the Toombodra River. It is situated in 15° 48' North latitude, and 78° East longitude. Its elevation is about 900 feet above the level of the sea. Bellary is distant 95 miles to the South-West, Cuddapah 130 miles to the South-East, Cumbum 116 miles nearly due East, and Secunderabad 130 miles North.

Kurnool is 165 miles from the Eastern and 305 miles from the Western Coast. The highway from Madras and Bellary to Secunderabad passes through the station. The town is placed in a hollow, the ground gently rising from it in

every direction. The Toomboodra, upon the south bank of which the remains of the Fort and the Pettah are situated, rises in the Western Ghauts, and divides the Kurnool country from the Doab, then running eastward falls into the Kistnah, about 15 miles from the town. It is about half a mile broad opposite Kurnool, and is generally full from bank to bank from June to October, when it gradually subsides and becomes a fordable stream. The bed consists of sand with strata of rock cropping up in all directions.

The Hindry is a small river, having its source at no great distance to the South-West of Kurnool. Its bed also consists of sand and rock. Vegetable gardens are formed in the beds of these rivers after their subsidence in November, and fine melons are raised by mixing the black soil with the sand.

Climate.—The temperature is said to be very high from March to the middle of June, when the rains commence, from that time to October it is variable, but generally pleasant, the nights being always cool. November and December are cool and bracing, after the latter month the heat gradually increases, the prevailing wind is from South-West to West from March to October, from North-East with variations to South-East from November to March.

The average rainfall is about 23 inches, which is spread over about five months, and seldom falls heavily, both wet and dry cultivation are carried on close to the town and round about the houses of some of the European residents. The remaining Europeans live in the Fort.

Water Supply.—The water in the town wells is brackish and not fit for drinking purposes, but the principal supply is derived from the Madras Irrigation Company's Canal which is brought from the Toomboodra, about 15 miles west of the town. The water runs in covered channels through the principal streets of the town, and is made available by open cisterns at intervals of 40 or 50 yards, from which the inhabitants draw their water for all purposes; these cisterns have lately been surrounded with well-made paving and drains to carry off the waste water. The water is probably tolerably pure before reaching the town, but there it becomes the receptacle of abundance of decomposing animal and vegetable matter.

Geology.—The town is partly built upon limestone flags so pervious, that water will run freely through them to appear again at the surface on a lower level at some dis-

tant spot, and partly on hard quartzite fissured by numerous trap dykes. The natural surface soil is regur which seldom exceeds two feet in depth, and in many places is entirely absent, leaving the bare rock exposed.

Sanitary Condition.—Although the position of the town is favorable for the purpose, no system of drainage at present exists, there are remains of well-built sewers which are either stopped up or buried. There is no surface drainage, each house has its own cess-pool excavated through the slabs or rock, the filthy contents of which either disseminate themselves in the air or percolate through the soil to become mixed with the drinking water of the inhabitants.

The streets are irregular, narrow and filthy, trees are scarce, and graves abound in every direction, intramural burial is still practised occasionally. The water channel before alluded to is on a lower level than many of the graves and cess-pools, so that it doubtless receives abundance of putrid organic matter from them. The channel itself leaks, and the water finds its way into the grain stores beneath the houses, and the damaged grain doubtless finds its way into the bazaars to be consumed by the poorer classes.

[Remedies for the above described state of affairs are engaging the earnest consideration of the Municipal Commissioners, but their funds are too small for placing the town in a thoroughly good sanitary condition, and the assistance of the Government is earnestly to be desired.]

Health.—Kurnool may be regarded as a huge graveyard, the living dwelling among the dead, placed on a soil incapable of deodorizing the putrid matter with which it is brought in contact, without any system of drainage, but with a system of water supply which intended as a blessing may, I fear, prove a source of danger to the inhabitants. It will surprise no one to hear that the population is decreasing, and that last year the alarming death rate of 86 in a thousand, was reached. In 1862 the population was estimated at 28,000, and in 1867 it barely reached 24,000! Fever, ophthalmia and diseases of the stomach and bowels, and guineaworm are endemic, and cholera is epidemic every year.

Cholera.—I have examined the records as far as they go, viz., from 1845. I find from that year to the present that cholera has only been absent altogether in seven years.

The years of its absence were 1847, 48, 52, 56, 57, 58, 61. From 1862 to the present time it has been epidemic yearly.

The epidemics are generally severe, those of 1849, 59 and 66 being unusually so. This year the epidemic was milder. In 1859, four Europeans died of it, and in 1866, out of thirteen male adults in this station, seven were attacked and five died, the attacks being in the ratio of 53 per cent. and the deaths to sick 71 per cent.—a truly lamentable state of affairs.

The District.—I have waited two months for information promised by the Collector about the principal towns and villages in the District; it has at length arrived, and I regret to say is of no value whatever. It is quite evident that the native subordinates entrusted with the duty of making the report are ignorant of the terms used or have filled in the form at random.

Thus cholera is said to be endemic in 459 villages, epidemic yearly in 133, and at short intervals in 229, now the monthly Mortuary Returns show that cholera is entirely absent from the district during several months of the year, which disposes of the statement of its being endemic. I have no doubt, on the other hand, that it is epidemic yearly in many more villages than the number mentioned, and that it is epidemic at short intervals in nearly every town and village in the district.

There are 27 places mentioned to which pilgrimages are made, but most of these are simply tombs or temples, to which the people of the neighbouring villages resort on certain days, the principal of these in which it is said to be endemic and epidemic are Streetsailem and Kurnool, but the statement with regard to the latter place is not correct.

In the Markapoor taluq six places of pilgrimages are mentioned, and cholera is said to be both endemic and epidemic in all, but no reliance can be placed on this or any other statement.

The dates of chief outbreaks are given in March, April, June, July, August and September from some of the taluqs, from four it is stated no date can be given. It is curious that no outbreak should have occurred in the month of May, in any taluq. Column 8* has been entirely misunderstood. "The point of departure" is invariably stated in the rainy season or one of the cold months thus giving a date for a place.

In four taluqs some villages are said to be exempt from

[* Vide Form of Return at page 106 of this volume.—ED. M. Q. J.]

cholera, the grounds of exemption stated are most absurd, being generally referred to the presence of some tomb or temple. No mention of geology or topography is made in any case.

The disease is said to have travelled to Cumbum from Masulipatam by a Regiment passing through in 1863, and to Chapalmudgoo Taluq from Guntoor in 1867. Markapoor, Kalva and Nundial all attribute the source to Streetsailem, and Nundikootoor to Kurnool.

All that can be gathered from the reports from the District is that cholera is epidemic at short intervals in every considerable town and village in the district, that it exists in some part of the district every year, that it sometimes invades the district from adjoining districts and at others has its source in the district at such places as Streetsailem or Kurnool.

Streetsailem is situated on the Nulla Mullay Hills, in the northern part of the district in the Nundikootoor Taluq, it is about 40 miles from Atmakoor and 60 from Kurnool. The soil is rocky, the place is uninhabited, except by a few Chencos (wild men), and the Pujari (officiating priest). It is surrounded by jungle and possesses a sacred well.

In February thousands flock to it from this and the adjoining districts to celebrate the feast of Seevaratri. There is another festival in April which brings people together at Streetsailem. On both occasions people, it is said, suffer much from fever and cholera, and the latter disease carried off many of the pilgrims in the last two years.

It appears that each pilgrim before starting provides himself with a dried sprig of *Davanum* (a species of Mint) which he drops into the sacred well abovementioned. It has been supposed that this is the cause of cholera, but however badly water may be impregnated with decomposing vegetable matter, I do not believe it will become a source of cholera, which I think has its origin in decomposing animal matter alone. Were it not so, cholera and malarious fever would go hand in hand, but where the fever is most intense there cholera is absent, while, on the other hand, cholera revels in towns and cities where malarious fever is unknown, the latter is essentially a disease of human origin, the result of centuries of violation of sanitary laws. I thus briefly allude to this subject, because I observe that some men of eminence in England have drawn comparisons between the

different stages of cholera and intermittent fever, have tried to establish a similitude between them, and broached the idea that the diseases may have their origin in the same source. A little experience in this country would dispel such ideas.

Nature and Progress of Cholera.—There is sufficient evidence to prove that cholera has its origin in India, but whether it first appeared at so recent a date as 1816, is doubtful. I was informed not long ago by an intelligent native gentleman that the disease was accurately described in an ancient Hindoo work published centuries ago, and that whole armies perished by it; it is possible that the allusion was to dysentery. I regret that there is no time to communicate with my informant before sending in this report, and that I have not access to the book.

The origin of cholera may, I think, be attributed to the insanitary condition of towns and villages throughout India, every one who has travelled in the Mofussil must be aware of their filthy condition. On approaching a village at night the traveller is often made aware of its vicinity through the olfactory organ before he has any other indication. Around these villages, wherever a hedge or nulla exists, without reference to distance or prevailing winds, will be found abundance of putrefying fecal matter which remains on the surface tainting the air until thoroughly decomposed. In this process, aided by a high temperature it is probable that an organic poison is involved, which being absorbed by the lungs, rapidly reproduces itself and establishes the disease. When once the poison is in action, it only requires a vehicle to carry it far and wide to invade places and countries in which it has not been before.

Cholera travels along the great ways at a rate coincident with that of human intercourse. It has been remarked that it generally travels from east to west and often in the face of prevailing winds. I think it will be found that it accompanies the prevailing traffic in whatever direction that may be, regardless of the atmospheric current. If this be so, it disposes of the theory of its atmospheric origin, although it must be admitted that the condition of the atmosphere by raising or lowering vital power is a predisposing cause or otherwise. Nothing has yet been brought forward to support the theory of a telluric origin, except that outbreaks have been traced to drinking water, but such water is always found to abound with animal organic matter.

If therefore cholera has its origin neither in the air, in the earth, nor from decomposing vegetable matter, it is not unreasonable to suppose that animal decomposition is its source, and that it is generated and propagated by man alone.

I regret that it is not in my power to give accurate information as to the topographic geology, &c., of places in the district besides Kurnool, noted for the presence or absence of cholera; the truth can never be arrived at by trusting to information supplied by native officials. Such information could only be obtained by a person thoroughly acquainted with and interested in the subject, visiting every such place.

ART. XIII.—On the use of the Alkaline Hypophosphites.

By W. FARQUHAR, M.D., Garrison Assistant Surgeon, and in Medical charge Cantonment Civil Hospital, Bangalore.

THE subject of this paper is to draw attention to some few illustrations, out of very many witnessed, of the remarkable and prompt efficacy of the Alkaline hypophosphites in the treatment of various diseased conditions attended with low nervous energy and general depression of the vital powers. As nervine tonics they are, in my opinion, unrivalled, and where their exhibition is indicated, they in a pre-eminent degree perform their work, *Cito tato, et jucunde*.

There is no pretension here made to introduce a new subject as indeed it is well nigh exhausted by Dr. Churchill, the original introducer of the hypophosphites into practice, and also by Mr. Taylor* of Liverpool. It is now some ten years since Dr. Churchill made the profession acquainted with his somewhat extravagant views regarding them in these words; "I know that they will prove not only as sure a remedy in consumption as Quinine in intermittent fever, but also as effectual a preservative as vaccination in small-pox." Much as they fall short of this exalted praise, those who have made a fair trial of them must know that their almost magical influence in causing the rapid disappearance of all symp-

* See his very excellent papers in the *Lancets* of November 30, December 7, and 14, of 1861, pp. 517, 544, 564, and Braith's Retrospect, Vol. XLV.

toms depending on impaired nervous power is very apt to deceive even the cautious observer into believing that a cure is being effected of cases otherwise held as incurable.

Though they cannot hold the high position assigned to them in the above quotation, their great value is yet to be learned by many, and Dr. Churchill may yet receive greater credit than he has yet done as the discoverer of their merits. All of several medical men I have asked, have informed me that they know nothing of them practically, and as they are not supplied to the "Service" by Government, it may be assumed that except in the Presidency towns where they are procurable, their use is quite exceptional, if it be not so there also. It therefore needs no apology, I hope, to rehearse such information regarding them as will place those not having the means of reference at hand, in a position to prescribe them. I am sanguine that only a fair trial of these medicines, of uniform preparation, is required to cause their being added to our present list of drugs indented for. In many cases, especially of tedious convalescence in European soldiers, the employment of such efficient tonics would be real economy.

Looking at what is believed to be their true *modus operandi* in the system, they may be regarded rather in the light of food than of medicine, as they supply to the system a regular constituent of nervous matter, phosphorus, which may have become deficient either by excessive excretion of phosphates or by a too scanty consumption of those nutritive food grains into the composition of which phosphorus enters largely. It might probably be found that the latter is the cause in some cases, in this country, of that utter prostration of nervous power which is not easily accounted for by any appreciable organic lesion or by increased temperature.

In experimenting with these medicines, it is very necessary to bear in mind Mr. Taylor's remark that "the diversity of opinion respecting their merits, mainly depended on the constitution of the salt used, *i. e.*, whether a hypophosphite or a phosphite or a phosphate more or less combined with a carbonate." The hypophosphites are asserted to be "the most soluble in all the animal secretions of all the oxides of phosphorus and are at once admitted into the venous system." Such a property of agents which rapidly stimulate and also sustain nervous power, is something in the way of

what Dr. Shortt is at present in so enterprising and creditable a manner, searching after, to counteract one of the most speedy destroyers of life, the poison of the snake.

I proceed now to make some selections from the very admirable paper of Mr. Taylor.

"Unguarded by a mild tonic, a carminative, a stimulant or an anodyne, as the case may indicate, a genuine alkaline hypophosphite is repulsive to the nerves of the stomach, and the patient refuses to take a second dose not of one drachm but even of two grains. My favorite adjunct is compound Tinct. of Gentian with Cinnamon water and sometimes a little morphia with a view of obtaining its quiet admission into the circulation without which no good effect could be reasonably expected.

"When once the vital powers have been aroused by a hypophosphite, the ingesta require to be much increased, as otherwise gastric irritability might ensue.

"As a rule the soda hypophosphite should be given in blood diseases and the potash ammonia or lime salt in those of the secretory organs.

"Either the vegetable alkaloids, ammonia, liq. arsenical: and such metallic salts as do not produce decomposition are not only chemically compatible, but highly efficient combinations when therapeutically indicated.

Mr. Taylor by a series of tabulated cases proved that "the guarded introduction of an alkaline hypophosphite into the blood produces a glowing influence, as a respiratory excitant expanding the chest; as a pyrogenic increasing animal heat and nervous force and removing erratic pains; and as a hæmatogen forming a nucleus for the rallying of red globules, it increases appetite and cheerfulness, controls expectoration, night sweats, and diarrhoea.

"It allays nervous irritation and implants the cementing principle which gives force to other aliments that have become defective through the lapse of phosphates."

As examples of cases in which it is useful, Mr. Taylor mentions "gestation, prolonged lactation, dentition, some forms of dyspepsia, anæmia, catamenial and leucorrhæal discharges, neuralgia and muscular pains simulating inflammation."

After satisfying myself by frequent trial that they were undoubtedly valuable, I was anxious to find if they would

prove so in the hands of others who had not previously employed them. I am able to state that several medical officers of experience have spoken with great enthusiasm regarding them, though they were, in the first instance, inclined to look upon their novelty as their only recommendation.

Recently the public have themselves been finding out their value in the shape of such preparations as Grimault's Syrup of Hypophosphite of Lime, &c., it is therefore time that their real value be ascertained by the profession and their range of utility defined, so that they may take the high place which they deserve in the list of legitimate medicines.

In the cases of which a very brief abstract is given below, the usual prescription except where otherwise mentioned, is that recommended by Mr. Taylor. R. Potass: Hypophosphit: ʒss., Tinct. Gentian: Co. or Tinct. Lavandulæ Co. ʒii. Aquæ ʒvi. Dose one tablespoonful. To the above I have found the addition of Spirit Chloroformi ʒiiss. a pleasant and useful improvement.

I may remark that the worse the case in which the Hypophosphites receive a trial, the more manifest will be their striking effects, whether in the way of cure, or only of temporary improvement of symptoms.

In case No. 1 before reading Mr. Taylor's very valuable paper, I gave a larger dose than he considers necessary or proper if the hypophosphite be a pure one. The effect however was excellent and speedy, and the medicine was discontinued soon, although, had it been necessary it could have been continued with the addition of Tinct. Opii. or Catechu, to check its laxative action.

CASE No. 1—28th August 1865, Colonel——, arrived from Western Coast in a very anæmic, weakly state; eyes sunken with dark areola; extreme nervousness and depression of spirits; loss of appetite; sickness and feeling of sinking after meals; pulse very feeble. No perceptible organic disease of heart, liver or kidneys. Skin moist; any mental emotion causes excessive perspiration; tongue pale, broad and flabby. Feels altogether out of sorts. Bowels sluggish.

A mild podophyllin pill was prescribed, to be followed by Quinine mixture.

On 30th August 1865, little improvement. Omit Quinine

mixture. R. Potass: Hypophosphit: ʒiss., Sodæ ʒi., Tinct. Lavandulæ Co. ʒiii., Aquæ puræ ʒvii.

M. ft: Mist: Dose two dessert spoonfuls three times a day before meals.

1st September 1865.—His first words were, "your medicine has acted like a charm. I feel quite set up again."

3rd.—Improving, omit mixture which acts slightly on the bowels.

To take a bitter tonic.

He took the tonic for a few days only, and on 26th November 1865, he returned to duty.

CASE No. 2.—aged 30, 5 or 6 years in India. First seen in June 1866.

Had been treated for fever about a month ago by a medical officer who could not conveniently attend him, and who expressed the opinion that he would "never move from that cot." His body was extremely emaciated, had a waxy transparent skin, chest very narrow. Inspirations shallow. Slight dulness over all the chest. Mucous râles general; was spitting blood in considerable quantities. Had night perspirations. His appetite was so impaired that he could not look at food; he was so utterly prostrated that he could scarcely raise a hand, and it was a great effort for him to speak; was constantly sighing.

For some days remedies were addressed to the relief of the more prominent symptoms, but without material benefit. After seeing more of the case, it appeared to me that the chest symptoms, bad though they were, could not be the chief feature in this case, as one often sees patients living only with a small portion of one lung yet still able to move about and exert themselves to some degree. Remembering that his system had for some time been under the depressing influence of malaria which doubtless lighted up the chest affection, I was led by this train of thought to apply a remedy to that portion of the system which had formed the first link in the chain of diseased action, *i. e.*, the nervous. I accordingly put him on the hypophosphite mixture. For a few days he took the medicine irregularly, but he soon came to notice its good effects, and then he took it eagerly. Day by day he reported some improvement, the first and most noticeable being the restoration of appetite. Many

days had not elapsed before the cough, spitting of blood and night sweats had all but gone.

Without entering into further details, it is enough to state that in a month after taking the hypophosphite, he was able to move to a chair in the verandah to the astonishment of several persons who had seen him a month before. His appetite was now excellent, and he was taking food and stimulants in fair quantities. A week more saw him able to take an airing in a carriage and all was going on well, till one evening I found him the worse of liquor, which he had taken freely on hearing some bad news. I now learnt that for some months he had taken to drink, which could not be kept from him. He now steadily retrograded as fast as he had improved, severe bursts of passive hæmorrhage from the nostrils took place now and again. There was now no more hope of his ultimate recovery. Towards the end of July I lost sight of him on my leaving the station temporarily. About the middle of August he went to Madras, where he died shortly after.

But for this patient's interference with his own favourable progress, there is no reason to doubt that the ultimate result would have been very different.

CASE No. 3.—Mrs. —, wife of an officer, and five years in India, arrived from Madras in a weakly state, with her whole body well studded with small painful boils. Always a nervous weakly person, she was now much depressed and exhausted from want of food and sleep. She was pregnant about four months. I prescribed the hypophosphite of Potash. Next morning she told me "that is the best medicine I ever had, I had such a delicious sleep." I told her to continue the medicine.

Two mornings after, instead of finding her on the sofa as usual, I was told to my surprise she had gone out. On leaving the compound I met her returning from the Railway Station. She remarked, "I am quite off your list now, your medicine has quite cured me." On observing that the boils at least were not cured, she said she could bear them now, as the medicine made her both eat and sleep.

She continued the medicine at discretion for two or three weeks improving steadily in health.

CASE No. 4.—Mrs. —, Æt. 21 years, wife of a civilian, the only surviving member of a number of sisters and brothers, all of whom had died of phthisis, was herself in

the last stage of this disease, and had colliquative diarrhoea. She was in an extreme state of emaciation, and her face looked quite aged. She was nevertheless, though chiefly, confined to bed, still able to get up and take a drive. Here, too, I prescribed the hypophosphite either as above or combined with opium and catechu, when required for diarrhoea. Of course no curative effect was here expected, but the patient expressed herself quite pleased with it, and took the medicine with pleasure whenever she felt low or depressed, saying it did her "more good than champagne." She within a month was carried off by an attack of diarrhoea.

The following case seems to show that even in the more stable form of a phosphate, the introduction of phosphorus into the system is beneficial, though of less speedy action.

CASE No. 5.—, an officer of over ten years' service, arrived here in a critical state of health with numerous large indolent abscesses on various parts of his body. These had been going and coming for some time while he was in Madras. They were undoubtedly pyæmic, but what the cause of the blood poisoning was, did not seem very clear. He had suffered, I believe, from rheumatic inflammation of some of the larger joints.

He was under the care of another Medical officer here, and was taking fabulous quantities of wine, brandy, beef tea, jelly, and champagne, daily, but without improving in strength or regaining lost flesh. On being called in to see this officer, I suggested the use of the hypophosphites, but, as the Medical officer had no experience of these, he enquired whether the phosphate of iron would not do as well. I said that I thought it would probably be useful in a lesser degree. It was accordingly given, and as far as could be

judged, improvement dated from the time it was first used. The patient believed, been previously given. himself was very decided in this opinion.* He went to England *via* the

Cape and perfectly regained health and flesh.

CASE No. 6.—, aged 2 years, daughter of an officer, and of weakly appearance. Having been seen by me always crawling on the floor, I found on enquiry that she had never walked. On raising her to her feet both inner ankles touched the ground, the soles looking outward. The two legs were only skin and bone. The mother had been advised not to let the child walk, till she grew stronger.

Considering that nothing but use could strengthen the muscles of the leg, and that it was high time the child should begin walking, I recommended the use of a boot with a sole thicker on the inside than the outside. I enjoined also shampooing the legs and feet daily and bathing with salt and water, and ordered the lime hypophosphite in $\frac{1}{2}$ grain doses three times a day: I had only recommended the above when I had to leave the station on duty. On my return 3½ months after, I was pleased to find the child moving about by herself, and the muscles of the legs gradually being developed. The mother told me that the medicine had been given steadily the whole time, as the child liked it and called for it continually.

There is no doubt that the mechanical treatment was aided and progress expedited by the medicine.

CASE No 7.— —, an officer of high rank in the Medical Service, sought a change of climate here on the score of his health. He had been in the station for some weeks, but had derived little or no benefit from the climate. He had an anxious, sunken expression of countenance; suffered from shortness of breathing, and occasional hollow cough, and—what troubled him most—there came up every morning with the expectoration, minute streaks of blood lying like isolated threads upon it. This seemed to prey much upon his mind, though he concluded from former exploration of his chest that there was no appreciable disease of his lungs. He had been much exposed to malaria. Considering the case as one of incipient tuberculous deposit, I proposed to treat it by medicated inhalations, but the patient not taking kindly to these, I prescribed the hypophosphite of potash in the usual way. On visiting him the third morning after prescribing it, and before I had time to speak, the patient said with emphasis, "Your medicine has done me a power of good; I can draw a deeper breath and walk without losing wind so easily, and there have been no streaks of blood." I saw the patient only two or three times again before leaving station for 3½ months. I told him that, if necessary, he would do well to continue the medicine for months. On my return I found he had been taking the medicine more or less during all my absence. He said he felt himself "a new man," and streaks of blood had never once appeared.

While the above cases exemplify the good effects of these medicines, a question sometimes arose in my mind whether

in such small doses it was possible, in any case, to do harm by them.

The following case shews the possibility of this, and is conclusive as to there exerting a direct action on the nervous system.

CASE No. 8.— —, *Æt.* 26 years, 10 years in India. Of florid complexion and nervous manner; a free liver used to suffer from sudden fainting fits from which a strong dose of raw brandy was, he said, the only thing that would rouse him. The day after he had taken the usual hypophosphite mixture he said that it set his head spinning immediately and he took no more that day. A second dose was tried with the same result.

ART. XIV.—*Report on Cholera at Thayetmyo, for the year 1865.* By D. MACPHERSON, Assistant Surgeon 2-19th Regiment, with Additional Observations by E. L. HIFFERNAN, Surgeon 2nd-19th Foot.

(Communicated by Inspector General British Medical Service.)

I REGRET that in the present paper I can add little to settle the great mystery, the origin of cholera, but I think many persons of experience, and to whom the world pays attention now, admit that if the disease has not its origin in inattention to sanitary laws, at least they own that after its commencement it is in this way fostered and its virulence increased.

My arrival at the station only dates from 16th December last, so that with regard to the earlier visitation I can but quote from information gathered from reports.

It appears in 1865, that cholera in Thayetmyo first shewed itself in March in the bazaar, whether the first patient was a resident, or whether he was a Burman, Chinaman, Negro, or half-caste is not stated, and it is not known whether the disease was imported from previously-infected districts, or arose *de novo* in the bazaar—there is no evidence offered either one way or the other. Of the number of cases that occurred during the month we are not informed, but six cases proved fatal. In April four deaths were recorded in the town, but the disease had not yet reached the cantonment. In May no deaths occurred, but whether there were

any cases which recovered in the town is not mentioned. In June we find a registry of six deaths among the civil population, and on the 27th a married Private of 2nd-19th Regiment was admitted into hospital. He lived in the new, large well-built, well-ventilated bungalow at the western extremity of the lines No. 3. No history is attached to the case. The next day another case was admitted a single man from the opposite side of the cantonment, he died; and on the morrow died the Serjeant Major of the Artillery, living more than a quarter of a mile to the northward of any of the previous cases.

In July no less than 27 deaths are registered in the town, and the disease had apparently ceased to exist in the cantonment until the 11th, when a soldier's wife, a neighbour of case No. 1, was admitted and died. Again there was cessation, and no other cases occurred among the Europeans until the 27th, when a boy about 12 or 13 years of age from the adjoining new well-ventilated bungalow, the son of a Corporal, was attacked and died, and on the 28th a man was admitted from the centre of the lines.

In August the town gives 3 deaths, the cantonment no cases; thus ends the first outbreak of cholera of 1865.

In September and October no deaths were returned in the town, but one case occurred on the 21st of October in the Hospital of the 2nd-19th Regiment, the man at the time of his seizure was convalescent and had access by the sick cart to the bazaar, but whether cholera was at the time in the bazaar or not, is not reported.

In November no cases are registered.

In December the disease begins again, and we find 34 deaths from cholera in the town on the 26th. A man of the 19th Regiment was taken to hospital with cholera; he came from the band, but at the very extremity of the lines he had been drinking heavily of spirits obtained from the bazaar the night before. The next case was a woman from No. 3 Bungalow (vide supra), which affords two cases; she too had been enjoying herself the Christmas night. The 3rd case came from the hut next to that occupied by the band, and two days afterwards the man who occupied the adjoining bed to case No. 3 was seized the same day. Another woman, case No. 5 from the same ill-fated bungalow, was admitted, and also one from that out of which two cases, Nos. 3 and 4, had come. Then the disease goes along the line of huts in a

southerly direction, and the next hut to one, to which gives the last case is attacked and sends one case into hospital; it then goes back to No. 10 company which had already given 3 cases, and the epidemic ends by giving a fatal case from No. 9 company in the centre of the lines; among the Europeans, 15 cases occurred with 6 recoveries and 9 deaths, while among the town population, 13 were treated in the hospital, giving 30.67 per cent. of deaths against 60.00 per cent. of Europeans.

During the outbreak in June Mr. Harding treated the patients with Ammonia, Tinct: of Lavender, Brandy and Champagne. In the December visitation they were treated on the elementary plan with an aperient to begin with; to unload the intestines of irritating matter, and to encourage alvine excretion of the poison, and water was given with bitrate of potass as recommended by an "Indian Surgeon" in the *Times* of last autumn as "a CURE." I regret he did not give his name, for then perhaps we might have known something more, for I am inclined from my experience to believe the "cure" valueless.

The patient had as much of this as they pleased to drink injection of Beef-tea with Carbonate of Ammonia and Chloride of Sodium. Nevertheless, my belief is that therapeutics are not to be much relied on until they can get something that will act on the great glanglionic centres paralyzed by the poison. To attempt to do anything with the bowels when absorption and secretion are in abeyance, seems to be like tinkering at the wires of a telegraph when the acid in the cells of the battery has been neutralized by an alkali.

The December outbreaks was characterized by great virulence. The patients who succumbed did not live to get into collapse, but they were knocked down at once as it were by a strong dose of fever-poison, there was no sweating, scarcely any sinking of the eyes, and the limbs remained round and plump.

The report of the cases treated in the Detail Hospital gives us different treatment and a very different result; they save 69.33 per cent.* Doctor Miller says "that only 13 cases were admitted into hospital, 9 of these recovered, 3 died and 2 absconded. All cases that came under immediate

* This is, supposing the two cases returned as absconded, died; for I presume they did not go far before they were default; if not, the mortality is reduced to 27.27.

"treatment recovered; the remedy that was found most effectual was acid sulph: dil: with tinct. opii and peppermint water. Acetum Plumbi and Opium did not answer at all. I had no case of cholera in the 5th Native Infantry; it did not attack them while here for three years: I attribute this to the healthy state of the Native Barracks and the excellent drinking water contained in the wells."

We here see that although the cause of cholera in the town is not set down; its absence among the native troops is ascribed to good sanitation.

The question which naturally arises is, Why is Thayetmyo formerly a healthy station, now so liable to epidemics? It appears from information afforded by Dr. Miller, that cholera always shows itself first in the town, but how it commences is not shown; the water-supply in the town is, I believe, extremely deficient and the conservancy bad, and now that the town is being built of bricks instead of bamboo, subject to periodical clearances by fire, the effect of the want of conservancy will be increased.

The great preference cholera shows for the European Infantry here I am not altogether disposed to put down to contact with the bazaar, because the Artillery, the Staff and Indian soldiers have quite as close a connection with it.

The first two cases in the December outbreak, it must be admitted, happened after a heavy debauch on spirits obtained from the bazaar, but the next two cases belonged to the "Band of Hope," so that small inference can be drawn from this fact, except that moderation, a great virtue, is the best.

How are the sanitary arrangements in and about barracks? not so good as they ought to be. The water-supply is very deficient, the allowance for each individual being about five gallons, a little more than two inches deep in the bathing tub; and the water I am inclined to believe is impure. There is but one well in the European Infantry Lines, and there are two in the gardens; the latter are scarcely ever used. When the river is high during the rains, the chief supply is directly from it by carts fitted with beer barrels: when the river falls, a small close channel, also used by the dhobies, furnish the supply; and on that drying up, shallow wells or pits were dug in the sand.

The Suddah Bazaar is a swamp after a shower, and the wells used by the inhabitants of the horse-keepers' lines is in

a native grave-yard now in use; the water derived from the wells in the Artillery lines is good and wholesome.

The night soil from the barracks was cast on the surface a very short distance in the jungle, and no latrines were used by the Indian troops: they retire into the jungle close at hand, the Commissariat followers did the same.

The old barrack huts were crowded and ill-ventilated, and the lines on my arrival were untidy, and refuse thrown carelessly about. There were no ash-pits to the cook-houses; the cook threw the refuse from the men's meal-table over the verandah into the grass, and then wiped the table down with their dhoties.

It is noticeable that the three attacks among the Europeans have occurred when there was a considerable amount of moisture and the rains not heavy, conditions favourable to putrefaction.

The number of cases out of the new married bungalow, No. 3, is another remarkable fact.*

ADDITIONAL OBSERVATIONS BY SURGEON E.L. HIFFERNAN.

In forwarding the enclosed "Tabular Returns"† of cholera at this station, I have only to add to the accompanying report, furnished on a previous occasion by Assistant-Surgeon Macpherson, 2nd-19th Foot, that it contains all the information I can give with regard to epidemics of this disease at this station.

I only arrived here in February of this year, and there has happily been no epidemic since my arrival. One case of cholera of a mild character occurred in one of the new wooden barracks in a soldier of the 2nd-19th Regiment, on the 4th of July last. He recovered, and there were no other men attacked even with diarrhoea. This was a purely isolated case, and cannot be traced to any cause, and came from one of the best situated bungalows in the cantonment, being on the highest ground.

An epidemic of cholera is said to have lately appeared in

* A case of Small-pox has just come out of it.—D. M.

† [Vide Return, p. 106 of this Volume.—Ed. M. Q. J.]

the large native town, south-east of the cantonment. No case has occurred since the 9th instant, and the Civil Surgeon reports the total number treated during this attack as (eleven) 11, and of these (four) 4 died. The total number of deaths reported in the town, from the first case of cholera reported on the 12th of October up to the last case on the 9th instant, were 15 (fifteen); and it is very questionable whether all these were from cholera, so that this has been an unusually mild "epidemic"?

The state of water-supply to the barracks, as reported by Mr. Macpherson, was every deficient last hot season. But there is now an abundant supply of good water in the wells, and several new wells are being constructed, so that I trust there can be no complaint on this head next dry season.

The native troops still use the jungle as an open latrine, as do also the inhabitants of the Suddah Bazaar, and Commissariat followers. But the night soil from the European barracks is carted into the jungle and buried.

The old barracks are not in use now. New, spacious, well-ventilated, detached buildings—one for each company—have been erected. The ground is kept clean around with proper ash-pits to each kitchen-house, and none of the irregularities described by Mr. Macpherson now exist.

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PART II.

REVIEWS AND NOTICES OF BOOKS.

Acholic Diseases; comprising Jaundice, Diarrhœa, Dysentery, and Cholera. With a Preliminary Dissertation on Bile, the bilious function, and the action of cholagogues. By ALEXANDER CHARLES MACLEOD, L.K.Q.C.P.T. &c., &c. Surgeon-Major on H. M. Madras Establishment. London: JOHN CHURCHILL & SONS, 1866, pp. 230.

WE were not prepossessed in favor of this little volume by finding in the Introduction an expression of something very like contempt for "figures and facts so called;" and a solemn warning to the author's younger professional brethren to be "mistrustful" of such things. Dr. Macleod probably considered his older professional brethren so far gone in their passion for facts and figures as to be past advice. "The noblest men of our profession," we are told, "those great and familiar names that stand out on the historic page with a lustre that renders needless enumeration—those lights of science have not much troubled the world with figures." This "fact" was new to us; and somewhat startling, unless the author intended "troubled" to be the emphatic word of the sentence. As we read on, however, we find that even they found "well-known and admitted facts" useful, as humbler men have done, although "their convictions have been always stated broadly and boldly unbolstered by figures, and bearing on their face the unmistakable impress of united genius and truth." May we venture to suggest that the profession would have summarily declined to accept such convictions as guides, unless the reputation of those who put them forward had been very effectually "bolstered" by proved aptitude for observing and discovering facts which had not previously been "well-known and admitted;" for combining both classes of facts so as to educe from them new inferences; and for stating the grounds for their conclusions by figures—which are nothing but facts summarized. Such a reputation once won, we are prepared to receive with all respect and submission opinions which we have good

reason to believe well-founded, and often to dispense with examination of the proofs on which they rest, but we must insist on the acquisition of the reputation as an essential preliminary to our recognizing the "unmistakable impress of united genius and truth." The Autocrat of the Breakfast Table, indeed, (whose monologues ought to be familiar to our readers), humorously expresses views somewhat similar to Dr. Macleod's. "All generous minds," he says, "have a horror of what are commonly called 'facts.' They are the brute-beasts of the intellectual domain. Who does not know fellows that always have an ill-conditioned fact or two which they lead after them into decent company like so many bull-dogs, ready to let them slip at every ingenious suggestion, or convenient generalization, or pleasant fancy? I allow no 'facts' at this table."

A little farther on in the same chapter our author lays down a canon which we are as unwilling to accept as his denial of the stubbornness of facts. "I hold," he says, "that in the establishment of any general law in natural science, the propounder is bound to use such arguments only as can be referred to universal experience and testimony." What meaning can be attached to "universal" in this dictum? There is, probably, no general law in natural science which is not based on facts which do not fall under universal, or even general, experience. The general law of gravitation, for instance, was demonstrated by arguments incapable of being "referred to universal experience and testimony;" though the particular case of terrestrial gravitation might have been so referred. However, Dr. Macleod evidently prides himself on his obedience to his own rule, and tells us complacently that he has "consistently refrained" from attempting to support his theories by facts occurring within his own experience! If a man who has, or thinks he has, general laws in natural science to propound, is to restrict himself to the use of materials lying within "universal experience and testimony," his own special experience becomes valueless, except possibly as suggesting a theory to be demonstrated, with self-imposed difficulty, by other means. One man is, on these conditions, as good as another, and Dr. Macleod's long experience of Acholic Diseases is rendered useless to the world.

In spite, however, of these and a few other eccentric opinions expressed in the Introduction, we continued to read

the book, and not altogether without profit. We found his contempt for facts not so strong in practice as his theories had led us to anticipate. We shall endeavor to give our readers a sketch of the views which the volume contains.

The first chapter is headed "On the Enteric Secretion of Bile," and argues that under certain circumstances the intestinal glands are capable of vicariously secreting a substitute for true bile. This, it appears, can only be "proved inferentially," and for this inferential proof Dr. Macleod professes to "trust less to any power of demonstration than to an intuitive perception, on the part of the student, of a physiological truth"—a broken reed, it seems to us! Intuitive perceptions, we fear, would form a less trustworthy basis for medical theories than even "facts and figures." The idea, however, is sufficiently plausible to deserve attention. Supposing the liver to be, from any cause, either inert or acting insufficiently, and the portal blood (necessarily) to continue loaded with the elements of bile, may not the intestines, he asks, "either from their own mucous lining or through the secreting glands with which they are furnished, or from both, supply bile, or a fluid resembling bile in its sensible properties, and therefore in its use in the economy?" To that condition in which true bile is either suppressed or deficient he applies the term "Acholia," which gives the key to the title of the book. In support of his supposition he cites the analogy of animals very low in the scale of life into whose intestinal canal a rudimentary liver directly opens, from which he infers that "the rudimentary position of the liver may be taken to be in the intestines themselves;" and that the liver of the vertebrata may be "physiologically regarded as a removal of these rudimentary livers and their assemblage into one common organ"—a view borne out, as he considers, by the lobular structure of the liver. "May not the various glands of the intestines, all or some of them, be in fact, in a subsidiary form, hepatic lobuli? Modified by their position, probably, both in structure and in function, but still rudimentary remains of the same organ, and therefore capable also of furnishing a kindred secretion. For it must be always borne in mind that they are in contact with the same "cholerized blood": i. e. blood charged with biliary elements."

The second chapter is devoted to arguing that the "pretty general opinion" which "prevails, in tropical countries

particularly, that a redundancy of so-called acrid bile is a frequent cause of various allied diseases, amongst which may be especially enumerated diarrhoea, dysentery, hepatitis and cholera—at least in its sporadic form * * so far from being correct, is in most instances at least, the reverse of truth; and I propose to shew, in the first place, that a temporary suspension of the function of the liver, with a consequent absence of bile, is a far more common defect, and at the same time an inevitable cause of irritation in the intestines, which nothing but a reproduction of that secretion can assuage or remedy; secondly, that this irritation shows itself in various forms, affecting under different conditions different parts of the intestinal tube; and thirdly, that these varying forms of irritation do in themselves respectively constitute specific diseases, as dysentery, cholera and diarrhoea.” To the belief, entertained by both patient and physician, of the acrid and injurious character of bile, accumulated in the bowels, he attributes the misuse of purgatives for the expulsion of the peccant secretion and the consequent formation of hepatic abscess. To Annesley’s practice of “a purgative every morning,” in the treatment of dysentery, he assigns as direct effect Annesley’s finding hepatic abscess so constantly in his cases. The practice has been to a great extent abandoned in the present day, and we think that Dr. Macleod’s views are so far borne out that abscesses of the liver are more rarely met with than they seem to have been in Annesley’s day.

A minor deficiency in the supply of bile, produces constipation, relieved by diarrhoea caused by the irritation of the bowels due to “hypercholerized” blood—blood from which the imperfectly active liver fails to eliminate the constituents of bile. In a different case, owing perhaps to malaria, “the function of the liver appears to be altogether suspended; a severer form of enteric irritation ensues, succeeded by ulcerative inflammation, and constituting the commonest type of acute dysentery.” The kidneys meantime employ themselves in performing the duty which the liver is neglecting, or at least in removing from the blood those elements which the latter fails to convert into bile. When the kidneys also strike work, the result is cholera. Such is the catena of “acholic diseases.”

Before proceeding to consider the treatment of each member of this class of affections, Dr. Macleod gives us a few preliminary remarks on Cholagogues and their Action. The

uncertain result of mercury on the constitution—the fact of its affecting at one time the liver, at another the bowels, at another the salivary glands—he explains by the analogy of many other medicines, which appear to act electively on different organs under different circumstances, and in different cases. Some diaphoretics, for instance, act on the kidneys if their specific action on the skin be prevented by keeping the surface of the body cool. Turpentine, again, in full doses acts as a purgative, in small quantities as a diuretic. So calomel in small doses irritates the bowels, in a dose of ten or twenty grains the liver, which is then “electively and exclusively acted on.” While this organ acts, no salivation or other symptom of constitutional injury will occur. If we desire to affect the constitutions generally with the drug, we attain our end either by administering doses too small to act upon the liver and stimulate it to the production of bile, (for the cholagogue action of mercury is taken for granted by Dr. Macleod throughout), or by clogging the action of the organ by combining opium with the calomel. This combination should be given only when the intention is to determine the action of the mercurial to some other organ or organs than the liver. We are told that in the practice of ordinary men opium is added to calomel “with a vague and timid notion of *limiting*” the effects of the latter “lest its action should prove too powerful,” and we are somewhat scornfully informed that the desired object might be attained by reducing the dose more simply than by addition of opium! We certainly thought that even blind worshippers of “facts and figures” would explain the combination of opium with calomel in cases supposed by the necessity for preventing the latter from acting on the bowels alone, and for thus determining its action to some other point; and not by their desire to neutralize their own efforts. But we must have been mistaken.

Coming now to special diseases, we find jaundice first discussed. It is divisible into two forms—Icterus Cholicus and Icterus Choloides. In the former “the bile has been duly secreted by the liver, and subsequently distributed throughout the body, instead of being poured into the duodenum.” In the latter the liver has not performed its function, and the constituents of the bile “pass on into the general circulation in some abnormal and highly morbid condition.” That the distinction between these two forms of jaundice is

not absolutely new Dr. Macleod admits, though the name of the latter has been made out of his own head, in supersession of the old term "pseudo-jaundice." "That, however, a state of intense acholia may exist; that the blood may be teeming with the uncombined elements or principles of bile, without their *visible* deposition in the tissues, or other such conspicuous manifestation of their presence; and that this is the case in certain diseases, and eminently so in dysentery and cholera,—is a pathological fact which, however intelligible, has not, as far as I know, been recognized in its full relation to disease, nor as its practical importance deserves." Virtual bile—the uncombined constituents of bile—does not, we are told, possess the characteristic color of actual bile; and may therefore be present in any quantity in the blood without discoloration of skin or conjunctiva. In fact "until after death" we have no evidence of the existence of the more formidable form of jaundice, "except such as is derivable from the extreme urgency of the objective symptoms, as coma, delirium, and convulsions, results of cerebral irritation on the one hand, or in the form of intestinal irritation (as in dysentery and cholera) on the other."

"Acute dysentery is essentially a disease of constipation," commences Chapter V. One form of the disease, indeed, and that a very dangerous one, seems to be attended by diarrhoea from the beginning. A malarious or a scorbutic taint is probably present in this case. The exception, however, is apparent only. The intestinal reaction "and the consequent diarrhoea, supervene so rapidly that the preliminary stage is overlooked." There are in fact, according to our author, in every case of acute dysentery *two* periods of constipation, one premonitory, "the other marking the actual invasion of the disease." The first is a simple state of costiveness, often overlooked; the second is a similar and aggravated costiveness, with pain, fever, tenesmus, and scanty disengagements of mere mucus, blood, or pus. The first is commonly succeeded by an interval of diarrhoea, or irregular action of the bowels, indicating reaction and an endeavour, often successful, to avert disease. This reaction does not, however, always occur, or is not apparent: in such case the first condition of costiveness is at once succeeded by the actual disease. The apparent discrepancy in the fact of the characteristic symptoms being preceded sometimes by a costive condition, sometimes by diarrhoea, is thus explained."

From Dr. Macleod's "acholic" theory of acute dysentery, it follows that his precept for treatment is "unlock the liver." The conditions in the premonitory period are described as including an inert liver, a state of dry congestion of the bowels or of fitful irregular action, and between these two extremes "a congested and hypercholerized portal circulation." Any purgative, it appears, oil, or senna, or calomel, acts as cholagogue under these circumstances, "unlocks the liver" and "harmony is restored." Calomel, however, is the surest and speediest key, contra-indicated by a liver congenitally sluggish, as in strumous habits, or rendered inert by disease. If the drug cannot act electively on the liver, owing to defect of that viscus, it will do more harm than good: but "ten grains of calomel, repeated at intervals of six hours, will, I believe, after the second, or at the most after the third dose, act *electively* on ninety-nine livers out of a hundred." Next to calomel, tartar-emetic is most highly recommended by Dr. Macleod, more especially for those cases in which mercury is contra-indicated. Ipecacuanha comes in a bad third—"a safe and efficacious remedy," preferable "in weakly and delicate subjects and in children."

The combination with opium, however, so commonly employed by those who approve of the ipecacuanha treatment of dysentery, is "under any circumstances to be avoided." Venesection is rarely necessary, but Dr. Macleod would "not hesitate to employ it when decidedly indicated"—nor would any one else, we presume; we all do, if we can, whatever is decidedly "indicated."

Chronic dysentery is merely a later stage of the same disease, dangerous in proportion to the shortness of the duration of the acute stage, and the violence of the reaction. In the phenonema of this affection, our author finds confirmation of his theory of the secretion of supposititious bile by the intestinal mucous membrane or glands. Although it very frequently happens that the gall-bladders of patients dying by this disease are found full of tarry bile, and the common duct "empty and more or less contracted, as if its natural use had been for some time suspended," yet the evacuations will have displayed various colors for some time before death, which they can only have obtained (if we suppose the liver inert) from false bile poured out from the internal surface of the intestines. Examination shows, moreover, a greater degree of this coloring matter in the

lower than in the upper parts of the tube—"more throughout the colon than in the ileum, less in the jejunum, less still in the duodenum, and none at all in the ductus communis choledicus [*sic*]. Thus there appears no other way out of the difficulty but to concede that the origin of this colouring matter is within the alimentary canal itself. By doing so, we admit a ray of light where all before was obscure and inscrutable; our pathological revelations allow of easy interpretation; and we are enabled to employ our resources if not more successfully, at least with a more definite conception of the object in view, and of the indications of cure."

We are not, then, to expect any practical benefit from Dr. Macleod's discovery in the treatment of chronic dysentery,—even if we fulfil his two, or rather three, indications; as he promises no greater degree of success from knowing the fact of the existence of his hypothetic bile. The indications, however, are stated to be—the restoration of the function of the liver, the suppression of the excessive and vicarious action of the intestines, and the carrying out of these two processes contemporaneously. "We must never lose sight of the circumstances that this vicarious action of the bowels has, in fact, been instituted beneficially, to compensate for the want of true bile; and if we interfere to suppress this factitious secretion without at the same time restoring the true, we shall be holding both hands of nature, and defeat the means that might have prolonged existence for months, or even have resulted in restoration to health." But as all medicines that act on the liver *may* act on the alimentary canal, and *viceversa*, it is obviously not easy to fulfil the third of the indications suggested above. "Could there be found an astringent remedy with which to restrain the bowels, on the one hand, and a pure cholagogue to incite to simultaneous action the liver, on the other we should probably hold the means of carrying out the required indications. But here the resources of our art fail us;" and though patients do sometimes recover, we must not suppose that we or our drugs deserve credit for affecting a cure. Rather than abandon his theory of active intestines and inactive liver requiring simultaneously opposite lines of treatment, our author ascribes recoveries to "change of air, or of diet; or a change in the prevailing wind, or in other conditions of the atmosphere; or in the physical and moral circumstances of the patient himself." "One or more of these, seconded, by the *vis medicatrix nature* have

generally at least as much share in the result as any remedies that have been employed." This is discouraging: but we shall see further on that there is balm in Gilead, and that Dr. Macleod has a remedy of his own which fulfils the incompatible conditions. Change of air, however, seems to be the grand remedy, especially when the disease is traceable to malaria. With respect to this case, our author ventures upon a most surprising piece of latinity, for the invention of which no one, we suspect, will dispute the palm—"A *movendâ causâ, tollitur morbus*!"

Having just learned the difficulty—if not impossibility—of contemporaneously checking excessive intestinal secretion and exciting a torpid liver to action, owing to the tendency of astringents to act simultaneously on liver and intestines, our minds are unsettled again by the idea of another sympathy between liver and alimentary canal, which appears to teach that the excessive action of one restrains that of the other, and *vice versa*. While the uterus is employed in gestation, the function of the mammæ is dormant; while the mammæ are secreting actively, the uterus often continues inert, or if it be impregnated, lactation is checked. "The idea of an analogous sympathy subsisting between the liver and alimentary canal is surely very interesting, even in the absence of obvious practical application." We confess to feeling no interest whatever in an 'idea' of a sympathy, if it have neither evidence to support it nor practical application to the cure of disease. The analogy in the present case, we learn, leads us sometimes to "hope that by checking the excessive and morbid discharge from the bowels, the secretion of bile may be thereby increased, though we know that this is by no means a uniform result." We begin to waver uncomfortably between fear of using astringents to suppress intestinal flux, lest they should also "lock" the liver more securely, and hope resting on the 'analogous sympathy' that a powerful astringent may by suspending all enteric secretion "institute a crisis of urgency" and "induce on the part of the liver a paroxysm of effort, resulting in an abundant and continuous flow of bile. Such an issue is conformable to our experience of nature's ways of working under desperate circumstances." Dr. Macleod, however, decides for us unhesitatingly. Without explaining why his analogy breaks down, (for impregnation occurring during lactation cannot be considered a 'desperate circumstance') he lays down the canon that "treatment by powerful astringents must meet

with unqualified condemnation, and we must endeavour to carry out by other means the *two* capital indications prescribed for our guidance." "*Partial and moderate astringent* only" is said to be not only the best and safest course (which is possible) but also "thoroughly consistent with the pathology of the disease here assumed;" (which we do not see). According to the principles which we have laboriously learned, partial astringent of the intestines will involve partial astringent of the liver too, whereas the indication is to "unlock" the latter. Why "gently and gradually reducing the superabundant flow from the surface of the bowels" should "gradually incite the liver to a modulated and daily increasing habit of secretion, till at length that healthy equilibrium is attained, when we may withdraw our medicinal aid, and trust to the awakened and now well-directed operations of nature," is not explained, nor does it appear to us explicable on Dr. Macleod's principles, or by his theoretical pathology. However, we confess we do not care much for the correctness of his theory if his practice is successful: and this we have no reason to doubt. Mineral astringents are free, he tells us, from the objections to which catechu, kino, opium, &c. are obnoxious, and possess the required property of "constringing the relaxed bowels on the one hand and stimulating the liver on the other." He has obtained great success in his treatment of chronic dysentery from the use of salts of zinc, copper, iron, silver, lead, and bismuth, and of the mineral acids, (especially nitric and muriatic), changed tentatively to suit each particular case. There is nothing particularly novel in his plan of treatment, except, perhaps, his avoidance of opium in combination with the mineral styptic selected. The value of nitric acid in the treatment of chronic dysentery, on which our author lays great stress, has long been known, but Dr. Macleod gives us some hints for the administration of it, which are worthy of notice. He reserves this remedy until the mineral salts have been tried, and have failed either altogether or after temporary benefit. He gives it in doses of from five to ten minims, made into a mixture with water and honey or sugar, and believes that in this form the acid is less likely to injure the teeth or to disagree with the stomach. For the use of nitric acid in enemata Dr. Macleod claims the merit of originality; and though, as we have seen, he set out with a determination to make no use of his own experience, we are happy to find

him forgetting his resolution in this instance. We quote his remarks on the subject:—

"I have tried the nitric acid injections in some hundred cases, both of chronic dysentery and of acholic diarrhoeas, and with still increasing conviction of its value: so that I now regard it as the easiest, safest and most speedy means of securing the specific effect of this valuable remedy. It may be used either in the small and concentrated form already described, or as an ordinary enema, in the proportion of $\frac{3}{4}$ iv.— $\frac{3}{4}$ vi. of the diluted acid to a pint of warm water or gruel. In either case it is better to commence with a moderate strength, to be gradually increased according to the effect and feeling produced. As a general rule it will be found that the older the disease, and the more conspicuous the signs of ulceration, the greater the strength of the acid that may be borne. For it is probable that in a healthy state of the membranes such a strong application would cause considerable pain. In all cases, therefore, before using the concentrated form, the presence of indolent ulceration should be ascertained by inspection of the stools.

"The use of the injection is quite compatible with the contemporaneous exhibition of other remedies, or with that of the acid itself in the form of draughts."

On the whole, this chapter on Chronic Dysentery is the best in the book, contrasting strongly with the chapters on Cholera which follow it. From these we learn that "cholera is an imponderable matter, or condition of matter." As every thing but solar light and heat—the actinic rays being, we presume, of no account—is "tellurial," cholera is so too, and therefore must be either of animal, of vegetable or of mineral origin. Not being atmospheric (because it can travel against the wind) and having no properties in common with malarious fevers which are of vegetable origin, cholera cannot be of vegetable origin: and besides, if it were "instead of arising at one point of the earth's surface, and then progressing or radiating to others, we should find it appearing at distant points simultaneously, wherever the necessary vegetable conditions existed." Again, "if there be no vegetable much less can there be any animal conditions confined and peculiar to the place of its birth"; and it is not contagious like plague and small-pox, therefore it is not contagious at all; as it would be if of animal origin. Not, then, owing its existence to vegetable or animal parentage, it must be mineral; which is confirmed by the fact that unceasing changes are going on in the crust of the earth. Comment on this extraordinary demonstration would be superfluous.

The next head of the chapter on the nature of cholera is, if possible, more wonderful still. Dr. Macleod having "enjoyed," as he oddly expresses it, opportunities of observing the course of the disease in India, became convinced of the truth of his second proposition that "this imponderable matter or condition of matter is attracted by some other matter or condition of matter, existent in, and peculiar to, the human body." If this means that human beings are liable to be attacked with cholera, it is undeniably true, though perhaps the information is not novel or very clearly expressed—it not being evident how one condition of matter could be attracted by another. If it means that the lower animals are incapable of the disease, it is certainly untrue. The argument by which the proposition is supported is worthy of the occasion. Large "masses of moving human life seem to exercise a powerful attraction on the cholera poison; and this attraction must extend to great distances, for it is notorious that a regiment in India on a march will contract and carry along with it cholera in a district where the epidemic is at the time unknown." This looks like an argument for the spread of the disease by human intercourse, fallen out of its proper place; but our next proposition teaches us that it is hopeless either to speculate on the method of propagation of cholera or to limit its spread by anything we can do. "Where a great space, as a continent or arm of the sea, intervenes, the earth itself may become the conducting medium. But all matter, whether animal, vegetable, or mineral, serves as a conducting medium." This is sad news for sanitarians. It was scarcely necessary to add the "practical deduction" that "no human means can avail to prevent permanently, the visitation of a country by cholera." "A deep rooted conviction among mankind generally" seems to be intended as an additional argument against the utility of preventive measures!

It will be sufficient to quote one more of Dr. Macleod's surprising propositions, referring our readers to the book itself for the "arguments" by which it is supported.

"Where present (that is, in the atmosphere, or supratellurial) it is attracted, and more or less neutralised, by every, even the healthiest, human body. In certain states, however, of the body, varying from health, the force of attraction is stronger, and the process of neutralization also more active and conspicuous. So long as the vital powers are sufficient to keep up this process of

neutralization and so preserve an equilibrium, the system is not overcome by the disease. But, under unfavourable conditions, the powers of life are not adequate to carry on through the lungs, a continuous process of neutralization. The poison is then, of necessity, conveyed through the lungs into the blood. Being there, a far more energetic process for its neutralization is required. A violent convulsion of nature ensues, and the symptoms of cholera are present."

One of the most remarkable features of that part of Dr. Macleod's book which treats of cholera is the calm unconsciousness which it displays of the views and labors of other workers in the same field. We could not, of course, have expected that in a small volume of 230 pages, devoted to a group of important diseases of which cholera is but one, we should find detailed discussions on the various theories which have been propounded with more or less plausibility to account for the origin and spread of the malady: but we might reasonably have anticipated mention, or at least consciousness of the existence, of the cryptogamic, the animalcular, the "grund-wasser" theories, or of Dr. Sanderson's experiments upon the communicability of cholera to the lower animals by the characteristic evacuations. This was the more to have been expected, seeing that the author elaborately, after his fashion, divides the possible origins of cholera into vegetable, animal, and mineral; and argues at some length in favour of the last. Perhaps his professed contempt for "facts and figures" may account for his ignoring the fellow-laborers who deal in them. So also the possibility of the cholera poison entering the constitution through the gastro-intestinal canal is scarcely alluded to—"not only the cholera poison must act primarily, on or through the lungs; but, inasmuch as the blood can nowhere else be brought into such intimate contact with a circumambient poison, such operation can nowhere also take place and must, therefore, be entirely restricted to the lungs."

With regard to treatment Dr. Macleod suggests the possibility of any medicinal agent possessed of the property, simply, or being a more virulent poison than that of cholera being capable of acting as an antidote to the latter. This idea has only lately occurred to him and he has had no opportunity of treating cholera "by hypodermic injection, of some of the more energetic and concentrated of our

stimulants; as strychnine, veratria, arsenic, iodine, bichloride of mercury, and phosphorus." The treatment actually recommended comes under the two heads of supporting the powers of life and restoring the functions of the liver and kidneys. The former is to be effected by the old-fashioned means of diffusible stimulants, frictions, and artificial warmth; accompanied by draughts of cold water *ad libitum*, to which he attaches great importance. The addition of nitric acid, with honey or sugar, to the water, is advised. "Where it is particularly relished, champagne, with plain water, or with soda-water is one of the best of drinks. Hot drinks of any kind are objectionable. Cajeput Oil as an embrocation is strongly recommended. The use of opiates and astringents is "utterly incompatible" with the views which our author has propounded and is therefore inadmissible in any stage of cholera. Opium has slain thousands who would have lived but for its administration. Ten-grain doses of calomel, "washed down" with some aromatic or stimulant draught, (which may be vomited and yet leave the calomel behind) are sufficient, "repeated as quickly and as often as circumstances may seem to require, until decided reaction is apparent. But calomel though the best agent for fulfilling the second indication for treatment is not the only one. Castor-oil, or tartar-emetic, or ipecacuanha or table-salt "would answer quite as well."

The concluding chapter On Sanitary Conditions contains little more than a protest against overcrowding, and futile attempts to remedy it by attending to cubical space alone, without reference to air. Dr. Macleod believes he is "correct in stating, that in all our public institutions, our prisons, barracks and hospitals, this principle of cubic measurement is the only one officially recognized and acted upon"! We are happy to assure him that he is mistaken on this point, and that a very slight degree of attention to Sanitary Reports and other works—repulsively redolent, it is true, of "facts and figures" but worthy of perusal by a physician preparing to propound theories on the origin and propagation of cholera—would have saved him from so inexcusable an error. It would give us great pleasure to be able to say that this was the only error in the book but we cannot but consider its theories to be, not merely unsupported by facts—for their baselessness is somewhat ostentatiously put forward—but also retrogressive and mischievous in their tendency if applied to the practice of Hygiene or Therapeutics.

- (1) *On the Origin and Propagation of Cholera in India by means of Religious Festivals and Pilgrimages.* By H. B. MONTGOMERY, M. D., Member and Secretary Madras Sanitary Commission (*Medical Times and Gazette*, January 27th, 1866).
- (2) *Abstract of the Proceedings and Reports of the International Sanitary Conference of 1866*, compiled by DR. A. H. LEITH, President of the Sanitary Commission, Bombay Presidency, 1867.
- (3) CONFERENCE SANITAIRE INTERNATIONALE.
- (A) *Rapport sur les questions du Programme relatives a l'Origine a l'Endemicité et a la Transmissibilité et a la Propagation du Cholera.*
- (B) *Rapport sur les Mesures a prendre en Orient pour prevenir de Nouvelles Invasions du Cholera en Europe*, 1866.
- (C) *Rapport sur la Marche et le mode de Propagation du Cholera en 1865-1866.*
- (D) *Rapport sur les Mesures Quarantenaires applicables aux Provenances Choleriques*, 1866.

Of the foregoing publications, the first being simply a contribution to a Medical Periodical, does not require any detailed notice, but we have printed the title of it, as indicating specially the subject of which we would direct the attention of our readers. Dr. Montgomery's remarks may be received as containing a brief but sufficient account of the general methods whereby during religious festivals and pilgrimages, epidemic cholera is generated or is disseminated throughout this country; but the remarks which he offers regarding the control of festivals must be regarded as of greater practical importance. This important subject has been recently made the subject of a very interesting report to the Madras Government, as we hope to re-publish this report in the first number of the New Series of this Journal; we shall not now enter upon it in detail, as will be seen, however, from our remarks below, the conclusions arrived at by Dr. Montgomery are quite in accordance with those

which were recorded by the Cholera Conference at Constantinople, who regarded pilgrimages in India, as the most powerful of all the causes which tend to the origination and diffusion of epidemic cholera.

We need scarcely remind our readers of the circumstances under which the Cholera Conference at Constantinople was assembled, nor of the unusually favorable circumstances which presented themselves to assist the Commissioners in arriving at definite and reliable conclusions regarding the points of importance laid before them for investigation and report. As the result of their deliberations, elaborate reports were published, designations of which are recorded above, the only objection to the general utilization of them in this country being that they were published in the French language, and that they were not easily procurable in India. To meet these objections Dr. Leith has prepared a very full abstract of the proceedings of the Conference, and we would strongly recommend those who are interested in this subject (and who is not so?) to procure and peruse a copy of this most valuable contribution to Medical Science. For those of our readers, however, who may be unable to do so, we submit the following excerpts from Dr. Leith's report, from which we have extracted the various questions discussed and the conclusions arrived at by the Conference. A careful perusal of these questions and replies will enable us to draw inferences regarding the best preventive and arrestive measures to be adopted against epidemic cholera.

Without further apology, therefore, we present to our readers the following list of the more important conclusions arrived at, regarding this mysterious disease.

Question 1st.—Whence comes Asiatic Cholera? Is it indigenous? In what countries is it now endemic?

Answer.—The Asiatic Cholera, which has several times spread over the world, is indigenous in India, where it had its birth, and where it exists permanently as an endemic.

Question 2nd.—Is Asiatic Cholera endemic anywhere out of India?

Answer.—Asiatic Cholera is never developed spontaneously, and has never been found to be endemic in the countries of Europe, the Caucasian provinces, Turkey in Asia, all the North of Africa, and the two Americas, into which it has come from without. As to the countries in the

neighbourhood of India, while admitting the probability, that Cholera does not exist in them as an endemic, it cannot be formally concluded that it does not.

Question 3rd.—Is there not reason to fear that Cholera may become naturalized in our (European, &c.) countries?

Answer.—It appears likely that by repeated invasions, the principle of the disease may in some manner be naturalized.

Question 4th.—Is there in the Hijaz an original source of Cholera, either permanent or periodic?

Answer.—Asiatic Cholera does not appear to have an original source in the Hijaz, but it appears to have been hitherto always imported there.

Question 5th.—Are there certain localities in India where alone Cholera is engendered, or which are particularly favorable to its development? In other words, is Cholera endemic in all parts of India, or only in certain districts, which it is possible to circumscribe?

Answer.—There are in India certain localities, chiefly in the valley of the Ganges, where Cholera is endemic, without its being possible to particularize all, or to affirm that they exclusively give birth to the disease.

Question 6th.—Do we know the concurrence of causes under which cholera has its spontaneous birth in India; also the circumstances which make it take an epidemic form?

Answer.—We do not know the special conditions under which Cholera has its birth in India, and reigns there endemically in certain localities?

Question 7th.—What are the circumstances that conduce to the development and propagation of epidemics of Cholera in India?

Answer.—Pilgrimages are in India the most powerful of all the causes which conduce to the development and to the propagation of epidemics of Cholera.

Question 8th.—Is the transmissibility of Cholera now proved by facts that admit of no other interpretation?

Answer.—All the facts hitherto ascertained demonstrate that cholera is propagated by man and with a speed proportioned to the amount and rapidity of his emigrations. The transmissibility of Asiatic Cholera is incontestable, and is proved by facts that admit of no other interpretation.

Question 9th.—Are there any conclusive facts that constrain us to admit that Cholera can be spread to a distance by certain conditions of the atmosphere, by winds, or any other change or modification of the air?

Answer.—Hitherto no fact has proved Cholera can spread to a distance by the atmosphere alone, whatever may be its condition.

Question 10th.—How is Cholera imported, and what are the agents in its transmission?

Answer.—From all that has been learnt, there are two things necessary to the outbreak and the spread of Asiatic Cholera in a locality—an arrival from an infected place and circumstances that favor the transmission. As regards the former, an arrival with Cholera is a complex affair; it includes man and his clothing, personal effects, merchandise, animals, the ship which carries him, and, in short, all that accompanies the man. Is all that constitutes an arrival equally capable of transmitting the disease?

It was a long while believed that the lapse of a few days between the departure and arrival without appearance of Cholera was a sufficient guarantee against the importation of the disease. But well attested facts show that even a long voyage, without appreciable accidents, does not ensure against danger. On the other hand, it is certain that the regular packet boats, that for many years have plied with India, have never imported Cholera into Suez. Without at present entering into particulars, it may be concluded that, even if every arrival from a country affected with Cholera be not capable of propagating the disease, it is not the less prudent, pending fuller information, to consider every arrival as suspicious.

Question 11th.—What are the conditions in which man imports Cholera?

Answer.—There is no doubt as to man being the principal agent in the importation of the disease. The arrival of a great number suffering with Cholera is not necessary for the causing of a great epidemic. A few sick, or even a single case, may suffice. There is no proportion between the amount of cholera imported and the intensity of the ensuing epidemic. The intensity is influenced by the more or the less favorable conditions of the locality, as a conflagration is not in proportion to the spark that kindles it,

but to the inflammability and the quantity of material that it meets with. One person with Cholera may occasion an epidemic.

Question 12th.—Can an individual with only choleraic Diarrhoea, communicate Cholera?

Answer.—A person coming from a source of Cholera, and although suffering only with Diarrhoea, may import the disease.

Question 13th.—What is the length of the time of incubation?

Answer.—In nearly all cases the period of incubation is the time lapsed between the moment when a person can have contracted the choleraic poisoning and the beginning of the premonitory Diarrhoea, or confirmed Cholera does not exceed a few days; all the cited facts of a longer incubation are referable to cases which are not conclusive either because the premonitory Diarrhoea has been included in the period of incubation, or because the infection may have occurred after leaving the infected place.

Question 14th.—Can Cholera be imported and communicated by living animals?

Answer.—There is no known fact proves that Cholera may be imported by living animals; but it is reasonable to consider them in certain cases as susceptible articles.

Question 15th.—Can Cholera be imported and transmitted by linen clothing, and generally by things in personal use?

Answer.—Cholera can be transmitted by articles of personal property coming from an infected place, and especially by those which have been used by sufferers under Cholera; and certain facts prove the disease may be carried to a distance by such articles shut up from the access of fresh air.

Question 16th.—Can Cholera be imported and transmitted by merchandize?

Answer.—Until fuller information be obtained, it will be prudent to consider as suspicious, unless in particular and defined conditions, every arrival from a centre of Cholera.

Question 17th.—Can the bodies of those who have died of Cholera be the means of importing and transmitting the disease?

Answer.—Although it is not proved by convincing facts,

that Cholera can be transmitted by means of such corpses it is prudent to consider them to be dangerous.

Question 18th.—What influence have the different modes of communication, by land or by sea, on the propagation of cholera?

Answer.—Communications by sea are from their nature the most dangerous; it is they that most certainly spread Cholera; and then come communications by Railways, as they in a very short time, can carry the disease to a great distance.

Question 19th.—What is the influence of deserts on the propagation of Cholera?

Answer.—Great deserts are a very effectual barrier to the propagation of Cholera. There is no instance of that disease being imported into Egypt or Syria by caravans coming from Mecca.

Question 20th.—What is the influence of assemblages or congregations (agglomerations) of men on the intensity of epidemics of Cholera; also on the propagation of the disease? and under what conditions does that influence operate?

Answer.—Every assemblage of men in which Cholera appears, is a condition favorable to the rapid extension of the disease, and if the assemblage is in a bad sanitary condition, to the violence of the epidemic. In like circumstances the rapidity of the extension is in proportion to the concentration of the congregated mass, while the violence of the epidemic, (all other things being equal) is the greater the less the individuals have already been under a choleraic influence, or if they remain uncontaminated by it; that is to say in other words, those who have already been under the influence of a source of cholera have a kind of relative and temporary immunity that counterbalances the grievous effects of the agglomeration. Lastly, in a congregated mass the more rapidly the epidemic spreads the more quickly also does it cease; unless new healthy arrivals furnish fresh aliment to the disease, and so sustain it.

Question 21st.—What intensity and persistence have epidemics of cholera in ships?

Answer.—The intensity of epidemics of Cholera on board-ships crowded with men is usually in proportion to the crowding, and is more violent when those on board do not come from a residence in a centre of Cholera; in crowded ships the progress of epidemics is generally rapid; lastly, the danger

of importation by ships and that of giving rise to a severe epidemic, are not altogether dependent on the intensity, or even the occurrence, of choleraic casualties that have happened during the voyage.

Question 22nd.—What influence have assemblages in lazarets, of persons coming from a source of Cholera, on the development of the disease among those in quarantine, and those outside the lazarets?

Answer.—The assemblage in a lazaret of persons coming from a place where Cholera prevails, has not the effect of producing a great increase of the disease among those in question, but such an assemblage is, notwithstanding, very dangerous to the neighbourhood, as it is likely to favor the propagation in it of Cholera?

Question 23rd.—What influence have great assemblages of men, armies, fairs, pilgrimages, on the development and the propagation of Cholera?

Answer.—Great assemblages of men, (armies, fairs, pilgrimages,) are among the most certain means of propagating Cholera; they form great epidemic sources which, whether the people march as an army or scatter themselves, as from fairs and pilgrimages, carry the disease into the country they go through; those assemblages after having been subjected, in usually a rapid way, to the influence of Cholera, become less susceptible of it, and the disease disappears from among them, it may be even speedily, unless new arrivals come to prolong it.

Question 24th.—What influence has dispersion on the intensity and the development of epidemics of Cholera?

Answer.—The opportune dispersion of an assemblage may lessen the violence of an epidemic of Cholera which has appeared in it, and may even prevent its spreading; but the dispersion would, on the contrary, cause great danger of propagation if it took place in the midst of places as yet free from the disease.

Question 25th.—What share has the pilgrimage to Mecca had in the epidemics of Cholera that have followed one after another up to this time?

Answer.—The part borne by the Mecca pilgrimage as an agent in propagating Cholera in the countries bordering on Europe has been the importation of the disease into Egypt twice, at an interval of thirty-four years; during the hot season,

Question 26th.—What influence have the sanitary and other conditions of a locality on the violence of an epidemic of Cholera; in other words, what are the adjuvant causes of cholera?

Answer.—Sanitary and other conditions, which in general predispose a population to contract Cholera, and consequently which favor the intensity of epidemics are indigence with all its consequences, the crowding of individuals, their unhealthy condition, the hot season, deficiency of ventilation, exhalations from a porous soil impregnated with organic matter, above all if matter be from choleraic dejections.

As it appears to be shown by experience the dejections of those with cholera contain the generating principle of the disease, it is legitimate to admit that drains, privies, and the contaminated waters of a town, may become agents in the propagation of the disease.

It seems to result from certain facts, the ground of a place once impregnated with choleraic matters can for a considerable time retain the power of giving off the principle of the disease and of keeping up an epidemic, or even of reproducing it when it has been extinct.

Question 27th.—What is to be understood of immunity as regards Cholera?

Answer.—The immunity which certain localities enjoy, that is to say the resistance permanent or temporary, general or partial, opposed by those localities to the development of cholera within their bounds, is a fact which does not preclude transmissibility, but which indicates certain places not yet all determined, are an obstacle to the development of the disease. The more or less complete and the more or less durable immunity which the greater number of persons placed in a Choleraic centre enjoy, an immunity that attests the individual's resistance to the poison, is a circumstance which should be held to be of the greatest value. Viewing it with reference to epidemic development, it is corrective of the transmissibility, and, as regards prevention, it puts on the way, means fitted to restrain the ravages of the disease.

Question 28th.—From the facts previously established, and which are connected with the generation, the propagation and the transmissibility of Cholera, can we deduce any thing precise as to the generating principle of the disease, or, at least, as to the mediums which serve as vehicles, or

receptacles; as to the conditions of its entrance into the organism; as to the ways by which it escapes from it; as to the duration of its morbid activity; in short, as to all the properties, a knowledge of which concern prophylaxis?

Answer.—In the present state of science we can announce only hypotheses as to the nature of the generating principle of Cholera; we know only that it is indigenous in certain countries of India, and that it maintains itself there permanently; the principle reproduces itself within man, and accompanies him in his peregrinations; it may thus be diffused to a distance from country to country, by its successive reproduction, without ever generating itself spontaneously, apart from man.

Question 29th.—What are the vehicles of the generating principle of Cholera?

Question 30th.—To what distance from a centre of emission can the principle of Cholera be carried by the air?

Answers to 29 and 30.—The ambient air is the chief vehicle of the generating agent of Cholera; but the transmission of the disease by the atmosphere in an immense majority of cases, is limited to a distance very close to the centre of emission. The instances cited of transport by the atmosphere to one or many miles distance are not sufficiently conclusive.

Question 31st.—What are the other vehicles of the choleraic principle?

Answer.—Water and certain ingesta may serve as vehicles for the introduction of the generating principle of Cholera into the organism, the ways by which the poisonous agent penetrates are chiefly the respiratory and very probably, also the alimentary, passages. Nothing has been ascertained as to entrance by the skin.

Question 32nd.—What are the chief receptacles of the choleraic principle?

Answers.—Choleraic dejections being incontestably the chief receptacle of the morbid agent, it follows that all that is contaminated with those dejections also becomes a receptacle, whence the generating principle of Cholera may be set free under favoring circumstances. It follows also the generation of the choleraic germ most probably takes place in the alimentary canal, to the exclusion, perhaps, of any other part of the organism.

Question 33rd.—What is the duration of the morbid activity of the generating principle of Cholera?

Answer.—Observation shows that the duration of choleraic Diarrhoea, called premonitory (which it is necessary not to confound with Diarrhoea that exists in times of Cholera) does not exceed a few days. The observations cited as exceptional do not prove that the cases of Diarrhoea which last longer are choleraic, and are capable of transmitting the disease when the individual has been removed from all cause of contamination.

The remaining portion of Dr. Leith's abstract is occupied by an analysis of the measures to be adopted for the prevention of cholera in India and elsewhere, but as these matters are not treated in the same catechetical style as those previously considered, we can only recommend our readers to refer to the original, which is full of interesting material. Nothing can be more conclusive than that hygienic measures of an appropriate character may tend to stamp out cholera at its original source, but much still remains to be done not only to develop the system of prevention which has been already most happily inaugurated within the limits of this Presidency, it is still necessary to prevent the importation of the disease by sea-going ships or to ensure the due isolation of the cases thus arising in lazarets and other places, which may, together with the enforcement of due quarantine regulations, tend to prevent the extension of the disease.

All these subjects are fully entered upon in the elaborate reports of the Congress.

We regret that space does not permit of our giving an abstract of these very important papers, indeed of a mere record of the conclusions arrived at would be of little use in the absence of the arguments on which they are founded.

Before concluding this brief notice of Dr. Leith's abstract and the papers to which it refers, we may submit the complete view of the doctrine of M. Pettenkofer as given by Dr. Mühlig upon the correctness or otherwise of the theory therein started. We refrain from offering any observations; we may however briefly accord our entire assent from the supposed correctness of M. Pettenkofer's views; we may also note that these latter are entirely opposed to the views held by the Constantinople Conference as recorded in their voluminous proceedings.

"The researches of Pettenkofer do not refer to the quality of the soil considered as a receptacle of the principle of cholera. Pettenkofer had established, what had before been advanced by others, that the quality of the soil of a locality is among the adjuvant causes of cholera, the most powerful; only he went much further, inasmuch as that he asserts that a soil possessing the qualities that he describes is so essential to the development of cholera, that the choleraic germ imported into a place, the soil of which has opposite qualities, will be perfectly innocuous.

"The soil that is favorable to the development of cholera is, according to Pettenkofer, porous, easily permeable to water and air, charged with organic matter (above all, excrementitious), and presents from time to time a difference in the level of the subsoil waters. But the time when the subsoil waters subside, and in consequence a certain relative dryness succeeds to an unusual humidity, will, according to him, be the most favorable for the development of cholera.

"Thus Pettenkofer concludes that two elements are indispensable to the development of Cholera: first, the importation of the choleraic germ into the place; second, a soil particularly constituted. Neither the former nor the latter of these elements suffices alone; both together are required: the person suffering under cholera will furnish the germ, the soil will furnish certain emanations which, in combining, whether it be in the atmospheric medium, or whether it be in the organism itself, will produce the choleraic infection."

இஃது. சுகாதார விளக்கம். சாதாரண ஜனங்களுக்கும் பாடசாலைகளில் கல்விகற்கும் மாணாக்கருக்கும் உபயோகமாகச் செய்யப் பட்டது.

The Elements of Hygiene, or easy lessons on the Preservation of Health, intended for popular use and for the use of Vernacular Schools. By W. E. D. (DANACOTI RAJOO,) Student Madras Medical College, 12mo. pp. 52, Madras Advertising and Printing Company, (Limited): Madras, 1867.

It is with considerable pleasure that we notice this unpretending addition to Medical literature, intended for the in-

formation of the masses of the native population scattered through the many Tamil-speaking districts of this Presidency.

It is the work of a Native gentleman who will shortly conclude his studies as a student in the Madras Medical College, but who, struck with the belief that it was ignorance of Hygienic principles on the part of the native population, which not only prevented their affording a cordial assistance and co-operation in carrying out sanitary improvements, but which also frequently induced them to offer to them a passive resistance if not active opposition, boldly determined to lay before his fellow-countrymen, in a few simple chapters, written in an easy and unaffected style, some of those general principles, a knowledge of which might at once explain to them the rationale of Government measures of sanitation, but also might briefly instruct them in certain Hygienic principles, which will be found of constant practical utility. That he has done this with remarkable success, it is our pleasing duty to record, and we find in the pages before us a really well arranged, clearly written, and admirably expressed epitome of the leading, more important facts of domestic sanitation and diathetics, the principles of health thus brought to notice by a member of their own community in a style and phraseology suited to their comprehension might, in our opinion, with great advantage, be made a topic of instruction for the senior classes in our Vernacular Schools, and this seems to have been one of the author's objects in compiling the little work under notice.

Before submitting a sample of the author's style of composition, so far as it can be conveyed by translation, we would briefly notice the subjects which he has selected for comment; he first of all (Chapter I.) notices briefly the necessity and advantages of some knowledge of the laws of health, and he directs attention to the evils which are likely, if not certain, to arise from the ignorance of such knowledge.

The second chapter is devoted to a consideration of the air and its chemical and physical composition the impurities, which it is liable, and the discomforts on the diseases arising from these, the subjects of ventilation and disinfection are also considered in this chapter.

Water is the topic next considered, and the best methods of purifying, together with the description of the ordinary country filters; concludes one of the most brief but, at the same time, one of the most important chapters in this little book.

The fourth chapter discusses at considerable length, the subject of food and its varieties, together with a consideration of the ultimate constituents which are likely to be formed by the different varieties of alimentary material introduced into the system through the stomach. Thus the various flesh-forming and heat and fat-producing foods are detailed, and lessons of practical utility based on the considerations thus enumerated are offered for consideration.

The author next considers the times at which food should best be taken and the quantities suited for consumption by ordinary individuals. In conclusion some useful remarks are offered regarding cooking vessels, and to these we would direct the especial attention of our Native readers.

Personal cleanliness—bathing and clothing—exercise—sleep—a few hints useful to young men—habitations—infectious and contagious diseases, and the best means by which people in general may secure themselves from infection of every kind—and mental and moral influences upon health form the several subjects of the subsequent chapters of the book.

We will perhaps do fairer justice to our author if we lay before our readers one or two quotations selected as fair specimens of the style in which he writes in addressing his native brethren, the first quotation which we extract is to our mind a peculiarly happy one, as from its anecdotal character, it is peculiarly suited to the comprehension of imperfectly educated native readers.

Alluding to the frequency with which we are likely to overlook causes of disease because familiar in their nature and constantly before our eyes, our author says:—

“It is generally from their own fault and imprudence that men lose their health and bring upon themselves diseases. It is true that sometimes some unfortunate people do inherit diseases from their parents. But then such parents first produce those diseases in themselves by their own ignorance and violation of the laws of health and then transmit them to their unfortunate offspring. Again it may be said that when any infectious and epidemic disease is prevalent in a town, even those who strictly observe the laws of health do sometimes fall victims to the disease. But it must be remembered that the ignorant portion of the population, by their inattention to sanitary laws and by their filthy habits, first of all generate the disease among themselves and then from this focus the disease spreads in all directions throughout the town and afflicts the innocent as well as the guilty.

"A certain gentleman who had paid much attention to the study of the human constitution, and who was well acquainted with the laws of health, had a rather ignorant brother living in a large town and he once went to see him there. While he was inquiring of his brother after the health of his family, the ignorant brother replied as follows: 'Although this house appeared to us at first to be a very good one and cost us an enormous sum of money, yet we have now found by our experience that it does not suit us at all. We do not know whether this misfortune is to be ascribed to the evil hour in which we entered into the house or to any thing else. It is nevertheless a fact that ever since we came to occupy this house there has not been a day in which the physician was not called to see us. Some time ago my wife was attacked with paralysis and it was much feared that she would permanently lose the use of her limbs. There are but few days in which I am free from headache or cold. My children are subject to frequent attacks of diarrhoea and dysentery. And as you know, last year a peculiar malignant fever attacked almost every one of our family and two of our dear children and a servant fell victims to it. Whether we shall ever become free from such misfortunes I do not know.' On hearing this story from his brother, the learned gentleman wondered and looked round for the causes of these misfortunes and at once discovered that his brother's house was situated on a lower level than the adjoining buildings, that the floor of the house as well as its walls were quite damp, that the house was ill-ventilated and kept in a filthy condition, that there was a cesspool and a dung-hill quite close to the building, and that the offensive smell from an adjoining gutter was intolerable. Then he replied to his ignorant brother thus: 'All the calamities you complain of to me are not to be attributed either to your bad luck or to the hour in which you entered into this house, but entirely to your own ignorance and to your having grossly violated the laws of health. If your house and its vicinities are allowed to remain in this condition, it is only to be wondered why worse calamities have not befallen you. So long as you remain in this house you may depend upon it, you will never be free from sickness and sorrows.' To this the ignorant brother answered saying, 'If what you have said is true, I will quit this house to-morrow. But I am afraid our misfortune will follow us wherever we may go. Who can avoid the decrees of Fate?' To this the wiser brother replied, 'It is only the indolent and the ignorant that ever plead fate for everything. Although man is everywhere subject to afflictions and trials, still it is our duty not to bring upon ourselves mischief by our own imprudence, but to guard against evils by every reasonable means. God has ordained some wise laws for the regular course of everything in this world and for the guidance of man, and so long as these laws are duly observed, all things go on well; but whenever they are vio-

lated, disorder and confusion will ensue. This is the fate appointed by God and nothing else. In the same manner there are also laws ordained in respect of our health which will be promoted or impaired according as those laws are observed or broken. I know that you have violated the laws of health, and that all the evils you have complained of are only the just reward of your imprudence.' By such wise observations he at last prevailed upon his brother to leave that house for a better one situated in a more healthy locality and taught him to strictly fulfil the laws of health; and the result was that within a short time the newly-enlightened brother and his family rapidly improved in health, all their former complaints disappeared and they lived for many years in the enjoyment of sound health and happiness. From the foregoing anecdote every one can easily understand the good results attending the observance of the laws of health and the evils arising from their violation."

We have before alluded to the very admirable way in which Mr. Danacoti Rajoo discusses the subject of water and its impurities together with the mode whereby it may be purified for domestic use.

On this subject he writes,—

"The ignorant people of this country spoil the water in their wells, tanks, &c., by washing in them their bodies, their dirty clothes, their cattle, &c., by soaking into them large pieces of timber, &c. Having in these and other ways saturated the good water of their wells and tanks with all sorts of filth, they nevertheless keep drinking the same water without the least hesitation. They do not understand that this filthy habit is a fruitful source of great many diseases. Sometimes the use of such water produces the disease—Guinea-worm—or as it is called in Tamil the nerve ulcer. The seeming nerve that comes out of the ulcer is not a nerve but in reality a worm, the small eggs of which deposited in the impure waters find their way into the human body, become developed into thin long worms, and finally find their way out by causing ulcerations in the body.

"There are various methods by which water may be purified. 1st. If water be kept for some time in a vessel without shaking it at all, some of its impurities will settle down to the bottom. 2nd. Again if a small quantity of alum or other astringent substances be added to water, some kinds of impurities will separate and settle down. The use of the seed of Strychnoo Potatorum (*சத்தூப* *சத்தூப*) for this purpose is well known among the natives. 3rd. When water is boiled, some impure gases that may have been held in solution in it, will escape out of it by the influence of heat, while at the same time some other impurities will be precipitated to the bottom. But water when boiled loses its taste and becomes

insipid. It is the air and carbonic acid held in solution in cold water that give it its taste, but when the water is boiled those gases escape out of it and the water consequently loses its taste. Therefore whenever good water cannot be had, a tolerably good substitute for it may be obtained by heating the water that is procurable till the impure gases contained in it are driven off and some solid impurities settle down to the bottom, and then gently decanting the clear supernatant water into a clean vessel. If this vessel be shaken well for some time exposing the water in it to the open air, the water will absorb carbonic acid and air, and recover its taste. 4th. There is still another better method by which water may be purified. Procure three large earthen pots and half fill one of them with fresh charcoal and clean sand mixed together and then make a small aperture at the bottom of the vessel and close it by loosely introducing into it a smooth round bamboo stick. Do the same with another pot, except that you half fill it with sand only and omit the charcoal. Then get a stand made of three bamboos and having three shelves one above the other. On the lowest shelf place the empty pot, on the middle one, the pot which contains only sand, and on the uppermost, that containing both sand and charcoal. Now pour water into the uppermost pot and it will gradually descend into the lowermost vessel after percolating through the sand and charcoal of the two upper vessels. By this method we will be able to get rid of many of the deleterious impurities that may be found in ordinary drinking water, and make it palatable and wholesome. It will be a good precaution to keep the stand in a place where there is no dust falling and to have the pots themselves covered with flat chatties, perforated with small holes. It would be advisable to have these pots occasionally washed and dried in the sun and then filled again with 'fresh charcoal and sand.'

In conclusion we may quote the opinion entertained of this work by a most competent judge with whom we entirely concur.

Extract of a letter from the Rev. Dr. S. D. SCUDDER, M. D.,

M. A., Arcot, to the Rev. H. BOWER, Madras.

ARCOT, Nov. 13th, 1867.

MY DEAR MR. BOWER,

"I have read carefully through the little work entitled "சுகாதார விதிகள்" or "Elements of Hygiene" by W. E. D.—and I have to say that I only wish a copy of it could be put into every native house in the whole land. It is a most useful little book and contains the very things the people of this country ought to know. I shall do all in my power to circulate it, and I desire to place it in the hands of my medical students at once. I will take a good number of copies if I can have them at a cheap rate. The Rev.

Mr. Mayou of Arnee also will take 50 copies if they are cheap. Kindly let me know the price at once, Mr. Mayou will circulate them in South Arcot and I will do my best to distribute them in North Arcot. W. E. D. may use my recommendation. I am only too glad to give my sanction and aid to all such endeavours. If W. E. D. is really a lover of Medical Profession, and if he has studied the sciences thoroughly, he should do all in his power to advance the vernacular Medical publications. He writes well—his Tamil is easy and good—simple. How I wish all who write in Tamil would use simple words—language that all the common people can understand. Many of our religious books and tracts even are not understood by half of those who receive them. I give out a great many and have taken pains to ascertain how far they are understood. Even those who read off the type very well, very often do not understand the meaning of the words. They have no Dictionaries. What then can they do? I trust W. E. D. will take up some good Medical work and translate it into good Tamil. With many thanks for your kindness in sending up the little work and with best wishes."

The Sewage Question, being a general review of all systems and methods hitherto employed in various countries for draining cities and utilising sewage: treated with reference to Public Health, Agriculture, and National Economy generally. Also a description of Captain Liernur's systems for daily inoffensive removal of faecal solids, fluids, and gases by pneumatic forces, combined with an improved method of sewage utilisation. Compiled for the information of Sanitary and Municipal authorities, and all interested in agricultural development. By FREDERICK CHARLES KREFF, Author of Statistical Book-keeping, Member of the Royal Institute of Engineers of the Netherlands, and of the Maatschappij van Nijverheid; Life Member of the Freien Deutschen Hochstift, and of the Senkenbergischen Naturforschenden Gesellschaft at Frankfurt on the Maine; etc. LONDON, LONGMANS GREEN AND Co., 1867.

THE object and intention of this work is sufficiently indicated in the following preface by the Author:—

The sewage question resolves itself into this: What is the cheapest and most efficient technical process for rendering human excreta useful instead of dangerous?

To answer it we give, in the following pages, a succinct account of all the various systems hitherto employed for that purpose;

and having drawn our information from the most reliable authorities, both English and foreign, leave the reader to form his own conclusions, not doubting but that, on the whole, they will coincide with our own.

Among the most valuable of these sources, of which we have principally availed ourselves, are the writings of Captain Charles T. Liernur, Civil and Military Engineer, who, during a number of years, has professedly had an extensive practice in various branches of engineering on both sides of the Atlantic. When we first contemplated to publish the result of our studies, he willingly placed at our disposal his own scientific and technical investigations on the subject in the shape of voluminous notes, with proper references for collating the facts mentioned.

Among these notes we found a description of a new plan invented by him, called the Pneumatic Sewerage System, which, after a close and conscientious investigation, we herewith submit, as, in our opinion, the best solution thus far given to a really difficult problem.

In this view we are not only countenanced by the approval of eminent engineers and agriculturists, who have, like us, carefully examined the invention; and of several scientific periodicals giving a critical description of it, but also by His Royal Highness Prince Henry of the Netherlands, who after mature deliberation, recommended it for adoption in the Grand Duchy of Luxemburg; and, further, by the now well-known fact, that the City of the Hague, after having submitted Captain Liernur's plan to a committee of professional inquiry, resolved *at once* to give it a fair practical trial at the public expense. Finally, the new system commends itself to general attention, because it is not some 'untried scheme of uncertain issue,' but a combination of practical contrivances with the actual working of which we are all familiar.

There can be no doubt of the high importance of the subject. Apart from the sanitary considerations involved, it directly bears upon the agricultural development of the country. All mechanical skill and industry, and all commercial enterprise, avail but little in the end, unless we also stimulate the soil to yield the largest crops without impairing its permanent fertility.

Scientific demonstration and practical experience go far to show, that the best means to obtain such harvests consist in properly utilising the ashes of the food we consume and the fructifying gases contained therein; in adopting improved modes of tillage; and further, in securing an increased action of the sun and atmosphere, such as may be suggested by a higher knowledge of vegetable physiology.

Leaving these latter means to be developed by future inventive talent, and treated by abler pens, we have endeavoured to contri-

bute our mite to the solution of the former, as those more immediately necessary.

These pages are principally prepared for the information of Municipal authorities and all others directly interested in Public Health, Agriculture, and National Progress; but in order to bring them also within the easy comprehension of other readers, we have thought proper here and there to explain certain elementary facts, generally within the compass only of strictly professional men, avoiding at the same time all technicalities wherever practicable.

May our labour not prove in vain, but assist in opening and smoothing the road to new fields of honorable and useful enterprise!

Without attempting an analysis of this most interesting volume, we may briefly summarise the conclusions arrived at by Mr. Krepp regarding the systems of sewage now in force in the great cities of Europe, and which are, with minor modifications, generally carried out by means of water carriage. He demonstrates with a clearness which is beyond all question the costly and injurious nature of the dilution to which sewage has thus been subjected and the increased difficulties as to its distribution thence arising is also fully considered. Mr. Krepp in Chapter IV considers the very important question of the utilization of sewage diluted by water and to our minds satisfactorily proves that whether this be effected by surface sewage channels, underground pipes, and distribution by bore and jet, or by subsoil porous pipes, it is equally open to objection.

These questions are considered not only in their sanitary but in their financial aspects, and the conclusions arrived at by the author are generally so unfavorable to any water carriage system of sewage, that we are prepared to find him advocating very strongly indeed a system of sewage which is certainly free from the almost numberless objections to all existing systems and which promises to fulfil the requirements which are really essential to an inoffensive system of house and city conservancy.

Those who desire to become acquainted with the system which Mr. Krepp considers capable of effecting this, would do well to peruse his description of Captain Liernur's Pneumatic Sewage System. A full abstract of this system shall be submitted to our readers in the first number of the New Series of this Journal. We may here notice however that Captain Liernur's system is intended to fulfil the following conditions, every one of which is essential to any-

thing which could be justly called a complete and inoffensive system of domestic and public conservancy.

(a.) Householders and citizens must not on any account be disturbed by sewerage operations; therefore no dwellings are to be entered for that purpose, either by day or by night.

(b.) For most important sanitary reasons all existing cesspools should be suppressed, and the construction of new ones be strictly forbidden by law.

(c.) All faecal matters must be daily removed, so that no fermentation can take place.

(d.) No gases whatever must escape during the removal of excrements, in order to avoid all pollution of the atmosphere.

(e.) No washing or 'flushing' by water must be required, so that the sewerage arrangement answers also in towns without so called water-works, and that privies may not become offensive when the water is cut off.

(f.) The privy basin must have no valve or contrivance liable to become deranged, and so give offence.

(g.) No substance of any kind, whether water, earth, lime, ashes, &c. must be used to dilute or change faecal matters, as this seriously diminishes or even destroys their agricultural value.

(h.) Excrements must be so arranged, for transport that they can, like any other commodity, be sent any distance to lands requiring fertilisers, without emitting the least effluvium.

(i.) When applied to arable soil, no gases whatever must escape, as this will not only cause a loss of most valuable fertilizing elements, but also convert the atmosphere into a medium for diffusing cholera and other diseases.

(k.) When applied to meadows, faecal matters must not be spread on the surface, as this will likewise pollute the atmosphere, and cause, besides, cattle diseases.

(l.) Whether applied to arable land or meadows, faecal matters must never come into direct contact with the roots of plants, as experience has shown this to be hurtful.

(m.) The whole sewerage system must be so cheap as not to saddle the poor with heavy rates, or burden municipal bodies with unmanageable debts, or cause the cost of collecting excrements to equal or exceed their agricultural value.

PART III.

MEDICAL MISCELLANY.

No. 1.—*Case of Hydrocephalus.* By Surgeon JOHN SHORTT, M. D., F. L. S., Superintendent General of Vaccine, Madras Presidency.

SOOBROYEN, Æt. 7, Caste Pullee, Laborer, (19th September 1867) was brought to the Bungalow at Tindivanam by his mother, begging. Has an enormous sized head, projecting greatly before and behind. Height of the boy 38½ inches, girth of chest 22 inches, arms 6. Head 31½ inches in circumference; measurement across the dome of skull from tip of ear to ear, 13½ inches. The shape of head is oblong, overhanging greatly before and behind, being slightly concave on the left, and a great bulging out on the right side. The square of the head, taken after Professor Busk's measurements, gives 11½ by 8 inches. The boy appears well nourished, but small for his age; has shed his incisor milk teeth both in the upper and lower jaws; eyes look heavy, seems unable to move them about freely; is slow of speech, but can express his feelings; can discern and name a dog or other animal; cannot walk. The lower extremities seem small and ill nourished, compared with the trunk and upper extremities; crawls after his mother on all fours; when called he does the same, he is the eldest of three children—the other two are quite well. His mother states that about six months after his birth, his head began to grow large, and has ever since been on the increase; has generally enjoyed good health, with the exception of the size of head. Parents alive and can assign no cause for present malady. The greatest prominence is at the several frontal and parietal eminences.

Remarks.—It is indeed wonderful to what size the head sometimes attains from an accumulation of water in the brain, and how trifling the effects are when the distension is

gradual and the work of time. Some years ago I remember seeing a girl, about the same age as the boy here noted, whose head was, if I remember rightly, double the size of the poor boy's. The child was exhibited as a sight in Bloomsbury, London, and the unnatural parents were making money by shewing the unfortunate child to the public. In this case also the parents are endeavouring to gain a livelihood by exhibiting the boy, and are quite averse to any remedial measures being adopted, although I doubt, in this case, if treatment would prove of any avail.

Hydrocephalus is by no means uncommon in this country. Dr. H. E. Busted reports a case in the *Madras Quarterly Journal of Medical Science*, Vol. I, Page 463. I have seen several cases myself. One particularly many years ago, which made a great impression on my mind at the time. In a village in Orissa, I saw a child aged seven months, in whom the head had attained an immense size; the measurements I took at the time have been mislaid. It would prove of interest if such cases are kept under observation, not only to note the size the head may grow to, but also what effects this slow pressure has on the brain itself and eventually on the life of the child.

No. 2.—Case of Bicephalous Monster, (a twin child). By W. HENRY FOSTON, Graduate Madras Medical College.

As cases of monster-birth in the human subject are happily exceedingly rare, every occurring case demands public notice, hence I beg to record the details of one that occurred here a few days ago, in the person of a Malay fisherman's wife, previously the mother of nine healthy children.

This woman was on the 25th returned delivered of her 10th child (female) after an easy and natural labour. On the following day, 27 hours having elapsed, she was again delivered, but of a monster female still-born, having two well-developed heads connected to the trunk by two distinct necks. This labour was a difficult one, and a right arm presentation. She suffered a good deal during the interval of these two labours. She was not professionally attended. The mother and first birth are, I am glad to say, doing well. No mental impression could be connected with this freak of nature.

PENANG, 9th July 1867.



MR FOSTON'S CASE OF BICEPHALOUS MONSTER.

No. 3.—*A case of Stone in the Bladder (Female) removed by rapid dilatation of the Urethra.* By Second Apothecary J. GORMAN, L. M. of Madras University, attached to the Lying-in-Hospital.

AN elderly lady, about 60 years of age, had been suffering for about two years previously to consulting me (25th April 1866) with irritability of the bladder, pain in voiding urine which was sometimes bloody, sometimes cloudy and often containing sediment of various colors—becoming ammoniacal rapidly on standing and generally very scanty. She frequently felt feverish and irritable, low-spirited, and seldom slept comfortably. Her digestion was impaired, appetite bad and bowels constipated. She was spare, looked haggard and pale, and said that she had lost flesh fast within the two years of her illness.

She had resided the greater part of her life in Calcutta where her illness began. Treatment in Calcutta did not benefit her at all, and she was advised to take a change. She came to Madras and placed herself under medical treatment, with little or no benefit. She was under the impression all along, according to her own statement, that she was suffering from a stone in the bladder, but never could persuade any of her Medical attendants, either in Calcutta or Madras, that this was the case. The consequence was that none had ever examined her to ascertain if there was a calculus. One told her to go to England and stay there for a time with a view to improving her failing health; another persuaded her that she was "breaking up," and must expect such symptoms at her time of life; a third considered a change to the Hills the best thing for her, and strongly advised her to try it. The patient, however, did not agree with any of the Doctors, but still held her own opinion, which ultimately proved to be correct.

I was attending two ladies in the house at the time, and this patient asked and obtained the consent of her then Medical attendant to consult me. She patiently repeated her whole story to me from beginning to end, and I attentively listened to it all. Feeling convinced that she must have good reason for so persistently asserting that she had a stone in the bladder, and that her symptoms corroborated her opinion, I questioned her minutely in reference to the sen-

GORMAN'S. *Case of Procidentia Uteri.*

sions felt on voiding urine, and whether she observed any obstruction or interruption to the stream, and finding that there were sufficient grounds for her belief, I proposed an examination of the bladder with a sound next day—not having gone prepared with one at that visit. The next day I found a calculus, and proposed removing it as soon as I could get her sufficiently prepared for the operation. I ordered a purgative, and after its operation put her on the Bicarbonate of Potash with Opium and confined her to bed.

On the 27th April I dilated the urethra sufficiently to allow of the introduction of the Lithotomy Forceps and removed the calculus at once. The orifice of the urethra required to be snipped slightly with a pair of scissors to permit of the extraction. She then had an opiate and was ordered to be fomented. For about a week after the operation, there was retention of urine and the bladder had to be relieved with a catheter. She was kept on the potash and opium all the time.

After this she did well and rapidly recovered her health, gained flesh, became quite cheerful, and after a few months returned to Calcutta in excellent health.

The retention of urine after this operation was rather a novel feature in the case; incontinence being the more common consequence. I presume this was due to slight spasmodic action of the neck of the bladder, arising probably from the irritation at that part produced by the rapid dilatation, and no doubt it was preferable to have retention under the circumstances to incontinence of urine.

The calculus was not weighed; it was about the bulk of a walnut but kidney-shaped, and is to be seen in the Medical College Museum.

No. 4.—*Conception and Parturition occurring in a case of Procidentia Uteri.* By Second Apothecary J. GORMAN, L. M. of Madras University, attached to the Lying-in-Hospital.

A NATIVE female, 30 years of age, had been the subject of Procidentia uteri for several months, when she sought relief for pain which she thought due to the misplacement.

It was ascertained, however, that she was at the time in

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MR. GORMAN'S *Case of Traumatic Tetanus.*

the seventh month of pregnancy, and that a premature labor was about to take place.

The uterus was protruding from the vulva to the extent of about 4 or 5 inches, and by account had been so some time prior to conception, (leading to the inference that conception had probably been the result of direct intercourse with the uterine orifice, without the vagina being concerned in the act), the neck of the uterus was considerably hypertrophied and measured about $3\frac{1}{2}$ inches in diameter, the Os Uteri freely allowed of the introduction of two fingers.

Labor pains went on regularly, the dilatation of the os, protrusion of the bag of membranes distended with liquor ammonia, and the expulsion of the foetus. All went on external to the body, as it was found difficult to return the uterus into the abdomen during the labor. Whilst the bearing-down pains of the second stage continued, it was found necessary to keep back the uterus with the palm of the hand pressed against it to prevent further protrusion, to which there of course was a tendency. The child fortunately was very small and passed through with ease; it lived only a few hours, the placenta came away with a little assistance, and then the uterus was immediately replaced, and the patient made to lie on her abdomen with a napkin firmly applied to the vulva, but the usual binder was not applied to the abdomen.

She convalesced well, and in a fortnight was able to leave her bed, still wearing the napkin, which she was advised to do for a month.

This woman has never had a return of procidentia, nor borne any children since; she enjoys good health.

No. 5.—*Traumatic Tetanus cured.* By Second Apothecary J. GORMAN, L. M. of Madras University, attached to the Lying-in-Hospital.

GUNNOO, a native of Nagpore, aged 20, of spare habit of body. This man, by account, got a compound fracture of both bones of the left forearm by a fall, and had the arm set by a potter in his native village. Mortification ensued, and he was brought into the station hospital at Seetabuldee, where amputation was performed at the middle of the humerus on

On the 5th February 1845. He progressed favourably until the 10th, when he first complained of inability to move his jaw freely, there was no pain in the stump beyond what was to be expected; the healing appeared to be going on well, but the discharge was sensibly diminished. He was ordered to take five grains Extract Cannabis every second or third hour. After the third dose he complained of a feeling of intoxication, but the state of the jaw remained unimproved.

The pills were still continued, and on the morning of the 11th he had a mercurial purge, which not acting by noon, and the patient being unable to swallow, a strong purgative enema containing turpentine was administered and twice repeated, with the effect of bringing away a quantity of dark-colored and highly-offensive fecal matter. After this he was ordered Enemata of Tincture Opii. $\mathfrak{z}\text{i}$. Aq. $\mathfrak{z}\text{ii}$. every second hour until he was well under the influence of the opium, which he was after the third enema. The muscles of the jaw then relaxed and deglutition was less difficult. A blister around the neck was now suggested and put on, but with the effect of aggravating the symptoms for a time. The bowels were again moved by strong enemata containing Croton oil two drops on the 12th, and he was again relieved sufficiently to be able to take nourishment (wine, beef tea and arrowroot) small quantities. The Cannabis (five grains of extract) was continued occasionally, but it was very difficult to get him to swallow it though given in solution. Morphia was also sprinkled on the blistered surface. The stump began to discharge again on the night of the 12th when the lock-jaw was better. On the 13th the ligatures separated and the discharge increased. His pulse was 106 and sharp, warm dressings were now applied to the stump, and opiate liniment with Ammonia rubbed well into the jaws—the Cannabis being continued occasionally with opiate enemata. On the 15th the report says—slept well after 10 grains of Cannabis last night—bowels moved three times yesterday. Has been observed to be worse in the mornings and to improve towards night; pulse 100; wound healing. On the 17th general tetanic spasms, (opisthotonos) in paroxysms of short duration, came on. Mercurial foetor in breath, though he had taken no mercury except that given with the purgative at the beginning. Was able to swallow, trismus much the same. Pulse the same, skin cool, bowels kept free, urine passed freely, a blister applied along the spine to the lower dorsal vertebrae, opiate draughts occasionally. On the 18th, 4 grs. of

Acet. Morph. were sprinkled over the blistered surface and the blister was afterwards kept open with savine ointment. On the night of the 20th there was considerable aggravation of the symptoms, when opium and cannabis were freely used and he was relieved.

The report of the 1st March says, "Is very weak, tetanic spasms not increased. Pulse slow and weak, very little food taken by the mouth. Has been taking 25 grains of Ext. Cannabis daily." The Cannabis was now discontinued and stimulants administered with as much nourishment as could be given him. On the 5th March was much better, cheerful, expression of countenance improved, took nourishment more freely, his pulse was stronger and he slept well. On the 8th so much better that all medicine was discontinued. He continued to improve steadily, and by the 26th was able to walk about well, had gained strength and flesh, the stump was quite healed, and he could open his mouth to a fair extent, though some stiffness of the jaws still remained. Being anxious to return to his friends, he was discharged.

No. 6.—Notes in reference to Plugging of the Os uteri and Vagina after delivery in Placenta praevia. By Second Apothecary J. GORMAN; L. M. of Madras University, attached to Lying-in-Hospital.

I WAS called at midnight to see a case of labour reported to have had alarming hæmorrhage, and went immediately. The patient was the mother of several children and about 28 years of age.

I found her almost moribund, bathed in cold perspiration, with a small thready and feeble pulse. On examination the placenta was found implanted over the os uteri, and the vagina filled with coagula—the membranes were unbroken and uterine action slight. I at once removed the clots, ruptured the membranes, and gave her ergot with ice and brandy. In a few minutes the pains increased in force and the patient rallied somewhat, and I assisted the birth of the child which presented by the breach. The ergot and brandy was repeated—the uterus contracted well and threw off the placenta readily. So far all seemed well.

The previous loss of blood however having been so considerable as to bring the patient down to the very verge of syncope, I considered it highly unsafe in that condition that she should lose any more—there was but a small trickling discharge, and I at once plugged the os uteri and vagina with *dry tow* to arrest it, watching the contracted uterus very closely, with my hand resting upon it all the while. Nourishment and stimulants being assiduously administered at the same time. She gradually rallied, and in two hours her countenance brightened up and she expressed herself as feeling much better. The plug was not removed for eight hours, during which time she had had an opiate, slept soundly, and took nourishment at intervals, for this purpose she had to be wakened.

This patient recovered gradually without any unfavorable symptoms.

Shortly after, I related this case to an eminent Medical gentleman, whose approval I fully expected in reference to the plugging *after* delivery; but he condemned the practice, and said that I had run a serious risk of having insidious internal hæmorrhage into the cavity of the uterus, notwithstanding the close watching of the contracted uterus kept up for hours. I resolved to profit by the hint and not to adopt that practice again.

It was not long however before a precisely similar case came on my hands again. My perplexity was great prior to the termination of labor, catechising myself as to what steps I should adopt, in case this patient, like the other, should become so prostrate from loss of blood, as not to be able to spare even the small discharge, which must necessarily continue from the vessels at the mouth of the womb, notwithstanding the firm contraction of the remainder. I lost no time in sending for the Medical gentleman abovementioned. In the meantime the labor terminated, the patient's condition was alarmingly low, the uterus well contracted, but there was the draining, a small, very small, stream of blood running gently down her thigh. She could not spare it, and I wished I had not been advised against the plugging, every thing else was done for her, but nothing served to stem that little stream of blood, and she gradually sunk.

I should add, that the gentleman alluded to, afterwards regretted having advised me as he did.

No. 7.—*Notes in Midwifery Practice.* By Assistant-Surgeon H. KING, A. B., M. B., Acting Superintendent Government Lying-in-Hospital.

No. 1.—*Case of Ruptured Vagina, and Extraction of fatus through incision in abdominal parietes. Death twenty-four hours after operation.*

PALLIUM, Æt 24, was brought to hospital at 10-30 A. M. of the 31st May, said to have been in labor about 32 hours. Pains, however, had ceased eighteen or twenty hours before admission, and vomiting had set in about the same time. On examination it was found that the fœtus and placenta had passed into the peritoneal cavity, through a rupture in the anterior wall of the vagina. The uterus was empty and firmly contracted. The rent had contracted, so that to bring the child through it again would have been, under any circumstances, difficult and dangerous; but in this case deformity of the pelvis—two fingers scarcely finding room between the tubera ischii—increased the risk attending an attempt at extraction *per vias naturales*. The patient had previously borne two children (still living) at full term; but had subsequently sustained a severe injury by the fall of a heavy beam upon her pelvis, the results of which had kept her confined to her bed for a year.

In consultation with Dr. Gorman, the able and experienced Apothecary of the Institution, the removal of the fœtus through an abdominal incision appeared the most advisable proceeding; with a view to prolonging the patient's life and rendering her death less painful; while it alone seemed to give hope, though very slight, of recovery. Accordingly the woman was brought under the influence of chloroform, and the operation was performed at 1-30 P. M. A large female child with placenta was removed from the peritoneal cavity, through a longitudinal incision from umbilicus to pubis; a straight knife with button-point being used, without director, to divide the peritoneum; and the wound was closed, after the amniotic fluid had been sponged out, by a single silver wire in whip-stitch. Peritonitis was seen to have already set in. A drachm of laudanum was given immediately after the operation.

At 6 P. M. the restlessness and prostration had passed away, the patient had apparently rallied, and seemed to be progress-

ing favorably. There was no vomiting. The skin was warm; Pulse 160; as it had been at the time of the operation. Serous fluid, no blood, oozed from both vagina and wound. Two grains of opium were then given. At 10 P. M. another drachm of the tincture was administered, after which the patient slept about four hours. A tea-spoonful of brandy and a table-spoonful of strong broth were given every half hour from 2 to 10 P. M.

At my morning visit the patient was found again restless. Since waking she had refused to take food, stimulant or medicine. There was little abdominal tenderness. An enema containing Tr. Opii. ʒii. was administered at 7 A. M., and retained. She continued restless with intervals of dozing. Pulse as before, subsequently vomiting returned; and the patient gradually sank dying, in a fit, at 2-15 P. M.,—about twenty-four hours after the operation.

Remarks.—This case deserves mention only on account of the rarity of the operation. So far as I can ascertain, abdominal section of the living subject had been performed once only, in the Madras Lying-in-hospital; also in a case of ruptured vagina, the patient surviving the operation eight hours. On another occasion, when the same accident had occurred (the placenta, however, not having been thrown off), the abdomen was opened immediately after the mother's death, with the object of saving the child, which was not attained. In a case of extra-uterine foetation, the operation was suggested—the foetus being alive and lively, but it was not tried, and the woman died undelivered. In the present case, the fact that eighteen hours or more had elapsed between the escape of the contents of the uterus into the peritoneal cavity, and the patient's admission rendered the chance of saving her life infinitesimally small. I believe, however, that life was prolonged by the operation; and also (which I consider of much more importance) that the patient's sufferings were considerably less than they would have been if she had been left to die with a foetus and placenta in the peritoneal sac. As regards after-treatment, I regret that opium was not exhibited more freely, and that the peritoneum was not washed out with tepid water—a procedure which I have known to be attended with the best results in cases essentially similar.

The inclusion of cases of this kind under the general name of "Caesarean Section" is not desirable; and it would be well if this term were restricted to the operation of removing

a foetus from the uterus through an incision into the abdominal parietes and uterus, applying "Gastrotomy" or some less ambiguous name to incision through abdominal wall alone, practised in cases of extra-uterine foetation, or rupture of vagina or uterus with escape of foetus into the peritoneal cavity. It is evident that there is very much less chance of recovery in these cases than in those of true Caesarean section; and that, therefore, including them in statistics, without distinction, is injurious to the reputation of an operation against which a more than sufficiently strong prejudice already exists in the minds of obstetricians, but one which, if performed earlier than it usually is, would be, I venture to think, very frequently successful.

No. 2.—*Case of rare malposition of the Anus.*—By the same.

A young Mussulman girl, supposed to have arrived at marriageable age, according to native ideas, was brought to the Lying-in-hospital a short time ago for examination, in order to ascertain whether the abnormal condition of the external genital organs was such as to preclude matrimony; and whether, if so, it was capable of being remedied by surgical operation. The external organs of generation were found perfectly normal in themselves (except that the hymen was absent), but the rectum terminated in front of the perinæum, immediately within the fourchette. A distinct depression in the position which the arms ought to occupy marked the posterior boundary of the perinæum.

I do not remember to have read of a similar malformation, nor have I been able to find such a position of the anus recorded in any work within my reach at present. No similar case has presented itself at this hospital within the last sixteen years at any rate. On account of its rarity I have thought it deserving of brief record. I need scarcely add that no operation was considered necessary or advisable.

There is some reason to infer from the experience of this hospital that malformation of the female organs of generation occurs more frequently among Mussulmans than Hindus.

No. 8.—*Case of lumbar abscess caused by ascarides lumbricoides. (Extracted from the Journal of the Triplicane Hospital.)*

VEERASAWMY, *Æt.* 28, pariah, was admitted on the 7th April, 1866, with an abscess on the back among the lumbar muscles, unconnected with the vertebrae. A small opening was made and the pus gradually evacuated. A few days afterwards the patient showed a small opening in the left groin, which was discharging pus, and which seemed to lead deep into the iliacus muscle. It had evidently been discharging for a considerable time, as the edges were callous. Fish Oil, *℥iij.* twice a day, was ordered.

On the 23rd June, the patient had improved on the whole. The skin of the loins, however, appeared to be undermined in several directions. Openings were made in depending positions. That in the groin was still discharging on the 22nd July. At this date the soft parts beside the spine were firmer and improved in condition, and the discharge from the opening in this neighbourhood had almost ceased. On the 20th August it is noted that "some days ago a large lumbricoid worm came out alive from the opening in the groin, and yesterday a dead one was gradually extracted from one of the openings in the skin of the loins near the spine. None have been passed by stool. These worms appear to have penetrated the wall of the intestine and burrowed in the muscles and intermuscular spaces of the lumbar and iliac regions."

The patient died on the night of the 22nd, "worn out by the long-protracted suppuration and disturbance of vital functions. The post-mortem examination showed the existence of lumbar and proas abscesses communicating by a sinus under the left kidney, which just touched the abscess and was discolored to the extent of an inch, but appeared healthy internally. The lumbar abscess was close to the spine, but there was no caries of the bones, and no worms were found anywhere. The intestines were not minutely examined, but there could be no recent perforation, as they did not collapse when moved aside."

No. 9.—*Case of Coma. (Extracted from the Journal of the Triplicane Hospital.)*

IYACUNNOO, a pariah, was brought to hospital on the 6th August, 1866, in a state of utter insensibility. Four months previously he had suffered from fever in Coorg, which had caused his return to Madras, where he obtained employment as a punkah-puller in a hotel. On returning to his mother's house on the morning of the 6th, he fell down insensible at the door and was carried to hospital. He was breathing regularly; pulse 84 and regular; no fever; no sign of central congestion. A blister was applied to the occiput, and on the following day another to the entire head. On the 9th he was reported to be lying "quite motionless, breathing regularly, and with a pulse ranging from 84 to 90: swallowing whatever is put into his mouth; passing his motions in bed; passing water in bed. This morning the arms were flexed across the chest, and required some force to extend them, but when extended they remained so. Abdomen a little tympanitic in sound, but not puffed." On the following morning the skin was hot; pulse quick and somewhat jerking; right pupil dilated and left contracted; less rigidity of arms. The patient continued to pass urine and feces in bed. He was ordered calomel *grs. x.* immediately, and *grs. iij.* every 3rd hour subsequently if he could swallow it. Mercurial ointment to be rubbed to inside of thighs twice a day. Next day he lay in nearly the same state, but appeared somewhat more sensitive, "when his lips and face are touched his muscles and eyelids move." On the 12th there was more appearance of returning sensibility and consciousness. He moved his eyelids frequently, especially when touched. Tongue dry and almost black, as far as can be seen. He was fed regularly, getting conjee every two hours. He had taken up to this time thirty grains of calomel, which was to be continued. He died on the following morning at 3 o'clock.

No. 10.—Case of Fracture of the base of the skull. Recovery.
(Extracted from the Journal of the Triplicane
Hospital.)

VEERASAWMY, Æt. 9, was admitted on the 5th July 1866, having fallen off a tree and struck his head on the ground. The left humerus was fractured about the middle, and there was bleeding from the right ear and from both nostrils. The left eye was closed by the contused and swollen upper lid which appears eschymosed. The condition of the eyeball could not be made out. The arm was put in splints, and a bladder of ice kept constantly on the shaven scalp. "There is no paralysis of any muscles. Has passed water, but not feces since admission. Slept a little during the night (of the 5th). Is at times noisy and troublesome; but this is in a great measure due to imprudent friends, all of whom but two have been turned out of the ward." He was ordered Calomel grs. iii. with Jalap grs. viii., and two pints of arrowroot congee. On the morning of the 8th he was quieter. No heat of head or fever. The bowels had been moved. A cold lotion was substituted for the ice. A grain and a half of calomel with five minims of laudanum was ordered to be given four times a day, and the arrowroot diet was continued. On the 10th he was doing well, quite sensible and rational—the head moderately cool, and bread and milk were allowed for food. On the 12th, he is reported to be quite cool and calm, with bowels natural, continuing to take the calomel and laudanum. Mouth unaffected. A blister had been applied to the occiput on the preceding day. During the night he was very restless, although fifteen minims of Tr. Hyoseyami had been given. In the morning (13th) the gums seemed slightly affected. The broken arm was put up in a starch bandage. On the 18th, the boy was discharged cured, but having lost the sight of the left eye. He was seen again on the 12th August, and sight was returning to the injured eye. He could "see the light but not distinguish objects." The pupil was dilated, and there was "haziness in the posterior half of the globe."

No. 11.—On the Analytical Examination of Chinchona.
By J. BROUGHTON, Quinologist to Government.

(From Proceedings of the Madras Government.)

1. I beg permission to complete, in the subsequent pages, the account of the results obtained in an analytical examination of the Chinchona of the Government plantations, the earlier part of which I had the honour of communicating in my Report dated 1st April 1867. This examination was absolutely required, in order to obtain, as far as possible, a knowledge of the existing conditions under which future work will have to be conducted.

2. It is for this reason also that I have paid special attention to the products of the Chinchona barks while in their fresh, green state, before being subjected to those processes of drying and transit, which I have reason to think considerably modify their chemical nature. By having the plants themselves so near at hand I possess a great advantage, which will not fail to lead to valuable results.

3. In the report above referred to, I had the honour of quoting some analyses of one of the varieties of Crown Barks, namely, that of *C. Officinalis* var. *Bonplandiana*. We possess, however, two other varieties of Chinchona *Officinalis*, respectively named vars. *Condaminea* and *Crispa*, and it appeared desirable to make a comparative examination of the bark of each under similar conditions of age, locality, elevation, &c.

4. Analyses of two samples of the trunk bark of var. *Bonplandiana*, of three years eight months old, from Dodabet plantation, and grown on grass land, yielded the following results, calculated in per-centages of dry bark:—

Statement of Analyses.

	I.	II.
Total alkaloids...	3.84	3.91
Quinine ...	1.64	1.83
Chinchonidine and Chinchonine ...	2.20	2.08
Sulphate of Quinine obtained crystallized.	1.5	1.61
Sulphate of Chinchonidine obtained crystallized ...	1.74	1.80

The thickness of the finer specimens of this bark was about 0.12 in. It contained an average of 73 per cent. of water.

5. An analysis of the bark of *C. Condaminea*.

Officinalis var. *Condaminea* yielded the following numbers:—

Statement of Analyses.

Total alkaloids...	4.08 per cent.
Quinine ...	2.05
Chinchonidine and Chinchonine...	2.03
Crystallized Sulphate of Quinine obtained...	1.54
Do. do. of Chinchonidine obtained	1.70

The amount of water in this bark was 73 per cent. For this fine variety of Crown Bark this country is indebted to Mr. Howard.

6. Analyses of the bark of *C. Officinalis* var. *Crispa*, grown on grass land of the same age as the preceding varieties, yielded in per-centages of dry bark:—

Statement of Analyses.

	I.	II.
Total alkaloids ...	3.72	3.81
Chinchonidine and Chinchonine...	1.42	1.54
Quinine ...	2.30	2.27
Sulphate Chinchonidine obtained crystallized.	0.80	0.87
Sulphate Quinine obtained crystallized ...	1.95	1.75

Other determinations of the gross amount of alkaloids in this variety of bark yielded respectively 3.31 per cent., 3.70

per cent., and 4.1 per cent. The mean of results being, therefore, 3.73 per cent.

7. From a report on this bark by Mr. Howard, dated February 1867, I observe that he arrives at very different conclusions respecting its value.* I have, however, spent much time in carefully verifying the grounds of my opinion, and have no hesitation in affirming that this variety of Crown bark is not essentially inferior in its yield of alkaloids to the other two. I believe the great discrepancy between Mr. Howard's analysis and my own, can be explained either by an unfavourable specimen of bark reaching him, or more probably by the quality being deteriorated by the mode of drying. It will also be observed that this bark contains Chinchonidine and not Quinidine. This result I have carefully corroborated by obtaining all the characteristic reactions of Chinchonidine. In examining its solution by polarized light, I obtained a strong rotation of the plane of polarization to the left and not to the right, as in the case of Quinidine. The reactions of quinidine I failed to obtain. I have the honor to forward a specimen of pure Sulphate of Quinine obtained from this bark.

8. From the above data I am compelled to conclude that there is scarcely any difference of yield in the three varieties of *C. Officinalis* as grown on the Government plantations. I would place little stress on the variations in the amount of Chinchonidine, as indicating a constant peculiarity in either kind. It is very remarkable that the specimens of the bark of var. *Bonplandiana*, which were one year older than those whose analysis is above given, and which were grown under partial shade, yielded little of this alkaloid, a circumstance which I had the honor of mentioning in a former report.† Dr. de Vrij found that the

* "No. 8. *C. Officinalis* var. *Crispa*.—Original bark unmoosed.

Crystallized Sulphates... 0.259

Alkaloids soluble in Ether ... 0.370

Insoluble in Ether, Chinchonidine a trace

0.629."—P. 2 of Report.

† "It must be evident that the var. *Crispa* should not be propagated, as it will not repay the expense of cultivation."—*Ibid.* P. 3.

† Proceedings of Madras Government, Revenue Department, No. 206, 12th April 1867.

Calisaya barks of Java were somewhat similarly affected, and contained more quinine when grown under partial shade. I think there are grounds for believing that when the branches of our trees are sufficiently expanded to screen their bark from direct sun-light, the amount of Chinchonidine in these barks will be found to diminish. The substitution to a greater or less extent of Quinine by Chinchonidine is a very general characteristic of all our best barks, though the range of replacement is wider in the Red.

9. For the manufacture of pure crystalline salts of the alkaloids, the varieties of *C. Officinalis* yield the most suitable barks in our possession. Their alkaloids crystallize as sulphates with singular ease, and are readily purified. The very considerable yield of such young trees (three years eight months) is worthy of special remark.*

10. The similarity in the amount of alkaloids yielded by the Crown barks is in harmony with the similarity of their botanical structure. The three varieties resemble each other so greatly that except in the case of individual plants, which possess in a special degree the attributed marks of their variety, it is very difficult to distinguish them with certainty. They are all mingled on the plantations. Had it not been for the kind and valuable assistance I have received from Mr. Batcock, who has taken much pains to select me specimens of undoubted origin, it would have been scarcely possible for me to have made the comparative examination I have had the honor to cite.

11. I have also made a careful investigation of the leaves of *C. Officinalis*. I worked with 3 lbs. of the fresh leaves; but though a considerable precipitate was at first obtained, I was finally unable to detect even a trace of alkaloid. I conclude, therefore, that the leaves of this species are destitute of value.

12. A similar examination was made with the ripening fruit. In this case I succeeded in obtaining indications of alkaloid; but the amount was so minute, that although I worked with a large quantity of the fruit, I was unable to determine its nature

* Since the above was written, I have obtained as much as five per cent. of alkaloids from trees of the same age, growing under very favourable conditions of soil, aspect, &c.

with certainty, nor did the most delicate tests for quinine indicate that substance. The fruit certainly contains less than 0.00002 per cent. of its weight of dubious alkaloid, and is practically worthless for officinal preparations.

13. I have already had the honor of communicating the results of an analysis of the bark of *C. Micrantha*.*

14. An analysis of the trunk bark of *C. Nitida*, four and a half years old, from Neddivuttum, gave the following percentages of alkaloid calculated for dry bark:—

Total alkaloids	...	...	...	6.00 per cent.
Alkaloid soluble in Ether	...	...	...	0.32
Chinchonine	...	...	...	5.54
Quinidine	...	...	...	0.14

Crystallized sulphate obtained ... 0.10

The bark was 0.17 inch thick, and contained 69 per cent. of water. A microscopic examination showed a great abundance of resin cells with but few cortical fibres. The Chinchonine obtained, crystallized with readiness. This bark and its products showed much similarity with those of *C. Micrantha*, though the alkaloids obtained were somewhat less in quantity. Six per cent. is, however, a large yield, and is treble that of the American *C. Nitida* bark.

15. The trunk bark of *C. Peruviana* gave, on analysis, the following numbers calculated for one hundred parts of dry bark:—

Total alkaloids	...	...	...	6.25
Soluble in Ether	...	...	...	0.41
Chinchonidine	...	...	...	2.00
Chinchonine	...	...	...	3.84

Crystallized sulphate Chinchonidine obtained. 1.80

The bark was 0.16 inch thick, and contained 72.9 per cent. of water. It differs from the other Grey Barks by containing two per cent. of Chinchonidine, differing in some respects

* Total alkaloids	...	...	...	7.1 per cent.
Soluble in Ether	...	...	...	0.3
Chinchonine	...	...	...	6.8
Crystalline sulphates	...	...	...	None.

—Report dated 1st April 1867.

from ordinary Chinchonidine, though its optical properties are apparently the same.*

16. From the foregoing analyses it appears that although the Grey Barks do not contain quinine, they are among the richest we possess in their yield of alkaloids. I would submit that the results obtained by the Chinchona Commission, respecting the efficacy of the alkaloids produced by these plants, hardly justify the disregard with which the Grey Barks have hitherto been treated. I would suggest that the cultivation of the beautiful-leaved *C. Peruviana* might be extended, with considerable advantage in many cases. A few plants interspersed among future plantations of *C. Succirubra*, would do much to relieve the monotonous uniformity of appearance produced by the latter.

17. An examination of the species of Chinchona that is "Unknown name" designated "Unknown name," yielded the following results. In the dry bark:—

Total alkaloids...	...	...	1.2 per cent.
Alkaloid soluble in Ether	...	...	0.39
Chinchonine	...	...	0.81
Crystalline Sulphates	...	...	None.†

The bark contained 73.4 per cent. of water. The alkaloids obtained are deficient in quantity, and are purified with extreme difficulty from the bitter resin with which they are associated. The amount of chinchonine that I was able to obtain in a crystalline state was small.

18. The cultivation of *C. Pahudiana* has long been abandoned. I made, however, for my own satisfaction, an examination of the bark. From it I was only able to obtain 0.3 per cent. of alkaloid. The bark of this species is thin, and a microscopic examination shewed that the fibres of the liber are more abundant and of larger size than those occurring in the more valuable kinds. Its structure presents few of the indications which are said to characterize the valuable kinds of Chinchona.

* I believe, with Mr. Howard, (Nueva Quinologia), that this alkaloid is identical with that described by Wittstein. I am at present unable to refer to Wittstein's Memoir, which is necessary for complete confirmation.

† Since Chinchonine crystallizes more readily in the free state, I invariably exclude it from the sulphates.

19. Among the unpromising-looking bushes, which are our eldest representatives of the *C. Calisaya*, there are but three whose bark is available for analysis. As this kind has already been examined by Mr. Howard, and its cultivation discontinued, I thought it better to reserve the examination of these few trees till special circumstances may render it necessary.

20. Experiments are in progress for the determination of the best season for cropping the bark on the large scale, but some time must elapse before these are complete. Comparative trials of the various methods of drying the bark for exportation must be postponed, till the atmosphere is less saturated with watery vapour than it is at this season.

21. In addition to the results I have had the honor to communicate in the foregoing paragraphs, I have been fortunate enough to obtain some of interest connected with the influence of soil and others relating to the physiology of the alkaloids and their occurrence. But until the application of these results has been verified by repeated experiments, I will, with the permission of Government, refrain from communicating them.

22. I shall have the honor of communicating further information on the effects of mossing the bark of the various kinds, as soon as the trees I have thus treated have been allowed sufficient time to yield bark available for analysis.

23. The question respecting a ready means of utilizing the barks in the form of some simple preparation for therapeutical purpose this country is receiving my best attention.

1. Ordered that the above report be forwarded to the Secretary of State, together with the sample of pure Sulphate of Quinine obtained from the bark of *C. Officinalis* var. *Crispata*.

2. It is observed that the samples of alkaloids prepared from the Red Bark, and received with Mr. Broughton's first report, were similarly forwarded.

3. The present report will also be communicated to the Governments of India and of the other Presidencies, and copies of both reports, together with that of the Chinchona Commission, will be forwarded to the Governments of Ceylon, the Straits' Settlements, Batavia, and the French Settlements in India.

4. The Government desire that attention be given by the Superintendent of the Chinchona Plantations to the more extended cultivation of the Grey Bark varieties, and that Mr. Broughton's suggestion for the intermingling of the *C. Peruviana* in future plantations of *C. Succirubra* be carried out.

5. It seems undesirable to extend the cultivation of the variety designated "Unknown name," the bark of which appears to be comparatively valueless. The Government will look with interest for Mr. Broughton's further reports.

No. 12.—*Report on Increased floods due to forest clearing for coffee cultivation in Coorg, Wynad and Western Mysore.* By E. F. C. CLEGHORN, M. D., Conservator of Forests.

(From Proceedings of Madras Government.)

1. In the Despatch of the Right Honorable the Secretary of State to the Government of India, No. 49, paragraph 7, dated 9th July 1866, it was observed that the remarks of Colonel Lawford and Major Sankey on the increase of floods, consequent on the extensive clearance of forest land for Coffee cultivation, "afford matter for serious consideration," and point to the danger of imprudently disturbing the general arrangements in the economy of nature.

2. The Government of India suggested to the Madras Government an enquiry into the effects of those floods, who thereupon ordered a renewal of the investigations carried on some years ago by Mr. W. Fraser, C. E., with the view of discovering suitable sites for re-forests near the source of the rivers.

3. Three evils are mentioned in the papers (Proceedings, January 1866, Civil Works (Communications), Nos. 41—3) as having resulted from the too extensive destruction of the forests, and various recommendations are made by Major Sankey to meet the altered circumstances of the country.

4. I.—*Effects of Clearings upon the Ghaut roads.*—Marked examples of the effects of clearing are given by Major Sankey, and numerous landslips and formidable breaches are shown in sketches by that officer. When the roads were made, there was dense undergrowth on either side, and a shady forest over head. The slopes have now been cleared both above and below the road, and the ori-

ginal cuts for drainage have undermined and breached the banks.

5. To meet this evil, Major Sankey makes three suggestions:—

(1). "Jungle for fifty yards wide should be preserved both above and below the roads."—This has been found necessary upon the hill roads of the Himalayas, as at Makassoo and Murree, and has a conservative influence upon the roads, especially when the slopes are steep. The planting below the road of Broom, Gorse, Capé-broom, Liburnum, Australian Acacia, and other plants of quick growth, has proved to be of use in binding the banks; this may be seen on the road between Ootacamund and Coonoor.

6. (2).—*Very steep slopes should not be planted with Coffee.*—This point has attracted much attention. It might be supposed that self-interest would be a sufficient safeguard, but not a few plantations have been abandoned after the soil has been washed away from the roots of the Coffee shrubs.

7. (3).—*Engineer Officers should be referred to in regard to clearings.*—At present, applications for grants of Coffee land are made through the Collector to the Forest Officer, who gives his opinion as to the advisability of sanctioning the grant. In many cases a professional opinion would be valuable, and it has been my practice, as Conservator in the Madras Presidency, to seek the advice of the Executive Engineer or Canal Officers, when there seemed to be any doubt about the application.

8. II.—*Damage caused to Bridges.*—Many examples are given by Major Sankey of damage to bridges in Coorg, caused by recent floods, the waterway being now insufficient, as proved by recent floods, the severity of which has been intensified by the clearing of forest in the upper part of streams.

I may observe that the erosion of the banks of the Cauvery near the junction with the Bhowani River in the Coimbatore District, attracted the attention of Mr. Grant the Collector, and was the subject of conference with me in the beginning of the year.

9. III.—*Threatened failure of Summer water.*—The question raised in Colonel Lawford's Memorandum, dated 13th November 1865, has a very wide scope, and requires the most earnest consideration. It is alleged by these two

officers, particularly Colonel Lawford, who has had long experience of Tanjore, that the annual freshes in Trichinopoly and Tanjore Districts have attained a height hitherto unknown, and that the scarcity of water between the monsoons may be seriously aggravated, or, in other words, that Coorg and Wynaad have become gardens, but apparently in some degree at the expense of Trichinopoly and Tanjore.

10. *Observations.*—It would appear from the water returns kept by the Superintending Engineer of Tanjore for twenty years, that this assertion is somewhat overstated; nevertheless the influence of thickly-wooded ranges in equalizing and regulating the flow of water precipitated from the sky is now generally recognized, and cannot be denied. During the last twenty years, the axe of the settler has been steadily at work, and clearing has gone on at a rapid rate along the line of Western Ghats. It was calculated this spring by Mr. Markham,* Secretary of the Royal Geographic Society, that 180,000† acres of forest had been cleared for Coffee, Tea, and Chinchona plantations. I travelled with this gentleman from Cape Comorin along the Ghats to Wynaad early in the year, and we were of opinion that physical changes and climatic influences followed the destruction of the forest on the eastern slopes, as any natural effect follows its cause.

11. The recommendations of the Engineer Officers quoted, are preventive of damage to communication, rather than remedial of the source of the evil. Whence come these floods? From the water flowing rapidly from the higher tributaries and streamlets. The water no longer percolates through luxuriant vegetation, mosses, lichens, leaves and fallen branches, but rushes down in torrents, unarrested in its course, and carries away the soil, the utilization of which

* "Within the last twenty years a great change has come over these forest-clad mountain districts in the establishment of many English planters, who have brought great material blessing to the natives, but in the extensive clearings of trees which they have necessarily made, have brought about a deterioration of the climate. In all, a total area of 180,000 acres of forest has been cleared for Coffee, Tea, and Chinchona plantations. One effect of this has been the occurrence of sudden floods, which have increased yearly in volume and destructiveness."—Extract from a Paper by Mr. E. R. Markham, F. R. G. S., printed in the Proceedings of the Royal Geographical Society for November 1866.

† This figure represents the aggregate area of all the forest land given up for these three industries in British territory, Mysore, Travancore, Cochin, but some of the early grants were large and one-third of the forest at least is standing.

is the planters' object in clearing the forests. The important action of the forests is to retain the rain water, and to regulate the superficial and subterranean drainage.

12. The construction of large reservoirs within the hills, as proposed by Sir Arthur Cotton, Mr. Markham, and the officers above quoted, and approved by Sir W. Denison the late Governor, if financially and physically practicable, would be most valuable as providing by art what was previously done by nature; but this would not prevent the injury to communications in the upper parts of the valleys, arising from encroachment upon the forests which formerly covered the mountains, nor would it alleviate some of the other evils which that destruction has occasioned.

13. The protection of the wooded crest of the ghats and of a certain proportion of the forest below, particularly in the eastern slopes and along the banks of streams, and also in certain situations, the restoration or re-planting of the hill sides would be more likely, than any other means, to prevent or diminish the evils alluded to in these papers.

14. Such measures as are here advocated would be acted upon more readily, if positive facts could be collected as to the present floods of the Cauvery, compared with what they used to be in former years, but the observations already made are sufficient to justify action in the direction indicated, without delay.

SIMLA, 12th September 1867.

No. 13.—*Regarding the disposal of Meteorites from India.*
(From Proceedings of the Madras Government.)

READ the following Despatch from the Right Honorable the Secretary of State for India, to His Excellency the Right Honorable the Governor in Council, Fort Saint George; dated India Office, London, 9th August 1867, No. 29.

With reference to Sir Charles Wood's Despatch of the 9th of February 1863, No. 6, I forward herewith a copy of a letter* from the Principal Librarian of the British Museum, together with a report† by the Keeper of the

* Dated 17th July 1867.
† Dated 11th July 1867.

Department of Mineralogy in that Institution, respecting the presentation to the Museum of Aërolites of importance obtainable in British India.

2. I have to request that your Excellency in Council will take into early consideration the report by Mr. Maskelyne, with a view to meeting, as far as may be practicable, the wishes of the Trustees of the British Museum, as expressed in the enclosures to Sir Charles Wood's above mentioned Despatch, and now communicated in Mr. Winter Jones' present letter and Mr. Maskelyne's Report. You will acquaint me with the result of your consideration of this subject, for the information of the Trustees of the Museum.

From J. Winter Jones, Esq., Principal Librarian, British Museum, to the Right Honorable the Secretary of State for India; dated British Museum, 17th July 1867.

I am directed by the Trustees of the British Museum to forward to you the accompanying copy of a report, which has been submitted to them by Mr. Maskelyne the Keeper of the Department of Mineralogy in this Institution.

I also beg leave to draw your attention to a letter addressed to the Secretary of State for India, by desire of the Trustees, on the 23rd of January 1863, asking the favour of the intervention of the Secretary of State with His Excellency the Governor General of India, that he would be pleased to take such steps as he should think fit to secure for the British Museum any Aërolites of importance that might be obtainable in Her Majesty's dominion in India. Looking to the scientific interest and importance of the subject in question, I am to express the hope of the Trustees that the views set forth in Mr. Maskelyne's report may be considered deserving your favourable consideration, and that the request which, as appears from Mr. Herman Merivale's letter of the 28th of January 1863, was made by the Secretary of State for India to the several Local Governments in India, in accordance with the suggestions of the Trustees of the British Museum, contained in their letter of the 23rd of January 1863, may not be withdrawn.

MINERAL DEPARTMENT, 11th, July 1867.

Mr. Maskelyne has the honor to report the presentation to the Museum by the Trustees of the Indian Museum at Calcutta of specimens taken from two Aërolites, those

namely of Gopalpur (that fell in May 1865), and of Sherghalty (that fell in August 1865).

Also by Dr. Oldham, as Director of the Geological Survey in India, of specimens of the Pokhra (that fell in May 1866) and Muddoor (that fell in September 1865) falls.

Letters from Dr. Oldham, announcing these presentations, have been referred by the Principal Librarian to Mr. Maskelyne to be reported on.

In them Dr. Oldham speaks of these fragmentary specimens as having been sent to the British Museum, "in accordance with a wish expressed by the Government of India, that the British collection should be enriched by specimens of all Meteorites found in India."

Mr. Maskelyne had understood that what Dr. Oldham terms a "wish" was, in fact, an order from the Home Government, not that fragments taken from Meteorites should be selected, and sent by Dr. Oldham, or any one else at Calcutta, but that, after the date of the order, the Meteorites themselves should be sent to London.

Dr. Oldham acknowledged that this was so in a conversation with Mr. Maskelyne on Saturday last, but he added that "the original order had been so far modified as to make the Trustees of the Indian Museum" (at Calcutta) "the medium through which all Meteorites sent in officially should pass." That gentleman further informed Mr. Maskelyne that the Pokhra Meteorite was "stopped in India" while on its way to London, and being sent in obedience to the general order of the Home Government.

Mr. Maskelyne thinks it very important in the interests of this Imperial Museum for the whole empire, no less than in those of European Science generally, that the original order of the Secretary of State for India in Council relative to these Meteorites should not be superseded; still more that it should not be "modified" by a local authority professing to act in the name of the Government, whether it be a Museum or the Geologist at the head of the Indian Survey.

It is true that Dr. Oldham has caused the purchase for the Calcutta Museum of the collection of Mr. Greg of Manchester, a collection remarkable, rather for the numbers of the Meteoric falls it contained, than for their magnitude or capacity for illustrating the different kinds of Meteorite.

That collection, when united with specimens previously at Calcutta, or since acquired in the manner above described, will form a fine series of Meteorites; but it will be comparatively lost in Calcutta, where there are extremely few persons to study it to advantage. In London, on the other hand, the Meteorites of India, as of other places (and Meteorites have no nationality), are constantly being studied by men of science, English, Foreign, and American, and the recent progress of science has given them a redoubled interest. It is in London that the great masses of these bodies would confer the most advantage upon science, while fragments properly cut from them (not as at present destructively broken off with hammers) could be sent as presents to Calcutta, and others again could be made the means of enhancing this collection by exchange with foreign Museums.

Meteorites are unlike fossils in this, that henceforward it will be impossible to procure collections of the former representing the falls that have been studied so laboriously during the past fifty years, except by minute and unsatisfactory specimens. It is, therefore, very important to keep up the collection here, which is the finest in the world, in the most perfect and complete condition.

Mr. Maskelyne would, therefore, respectfully suggest to the Trustees that they should exercise their important influence in averting the evil that would befall this collection if the order of the Secretary of State for India were to be superseded here or neglected at Calcutta.

(Signed) N. S. MASKELYNE.

Professor Owen is of opinion that the remarks in the foregoing report are just and to the point, and that it is of great moment in the elucidation of one of the most interesting and obscure problems in Meteorology and Mineralogy that Professor Maskelyne's suggestion should receive the favourable consideration of the Trustees.

(Signed) R. OWEN.

ORDER THEREON, 23rd September 1867, No. 1184.

The Governor in Council directs that copies of the foregoing Despatch, and of its enclosures, be sent to the Collectors of the several Districts in this Presidency, who will

report, without delay, whether there are any Meteorites procurable in their respective districts, and will furnish, with reference to any that may be, or may have been, brought to their notice, as much information, of the nature of that indicated in the Memorandum appended to Sir C. Wood's Despatch, recorded in the Proceedings of Government under date the 9th April 1863, as they may be able to procure.

2. It is understood that Meteorites have recently fallen in the Districts of Kurnool and Cuddapah. The Collectors of these districts will report on this point, and will explain why the instructions conveyed in Sir C. Wood's Despatch, above adverted to, have not been observed.

No. 14.—On the Borer in Coorg. BY G. BIDIE, M.B., Professor of Botany, &c.

(From Proceedings of the Madras Government.)

I have the honor to report, for the information of Government, that, in the month of September, I visited Coorg, with a view to collect some facts regarding the ravages of the insect called the Borer, which has lately caused such destruction on coffee plantations there, and in the neighbouring districts of Wynaad and Munzerabad. It is now upwards of four years since I last visited Coorg, and the first thing that struck me on the present occasion was the altered appearance of the country. In every direction the sides of the hills and ravines have been stripped of their umbrageous forests, and, instead of the magnificent expanse of living green that used to meet the eye on all sides, we have numerous sterile looking tracts, which give a peculiar air of desolation to the prospect. Did the evil, however, effected by clearing, not extend further than this, it would be of no great consequence; but, as has already been brought to the notice of Government, the extensive destruction of forests in Coorg has had a serious effect on the streams, that, rising amongst its hills, descend to fertilize the plains. There is no reason to suppose that, although every tree in Coorg were cut down, the rain-fall would be sensibly diminished, as its amount depends chiefly on the geographical position and physical confirmation of the country; but the existing clearing has, undoubtedly, had the effect of

causing a large portion of the monsoon water to run off almost immediately, instead of lodging in the forests, as it used to do, and, by evaporation, rendering the air moist during the dry season. I have no doubt that this change in the drainage of the country caused the droughts of late years to affect Coorg much more seriously than they would otherwise have done, and feel sure it will continue to render the culture of coffee there always more or less precarious. Coffee is a plant which delights in a moderately warm and moist atmosphere, and suffers much when subjected to a dry heat. Considering, therefore, that in Coorg it is deluged with rain during six months of the year, and exposed to scorching sunshine, with the earth baked as hard as a brick, during the remaining period, it is astonishing that it thrives there so well as it does. I have made the foregoing remarks with a view to show that the vigour of the coffee plant may have been impaired by the accidental changes that have recently taken place in the climate, through the great destruction of forests.

2. Much of the land now under coffee in Coorg is very ill-suited for the purpose, it being so steep that no care or ingenuity can prevent the surface soil from being washed away. Two or three monsoons are, in general, sufficient to sweep off every trace of humus, and the plants then get down on the cold, hungry subsoil, which consists chiefly of clay, decaying gneiss and knolin, and is notoriously deficient in lime, phosphate, and other elements, without which coffee cannot live and produce remunerative crops. Owing to this and the exhausting effects of fruiting, plants on estates which have been five or more years in existence have, as a rule, a very sickly look; and, under the present system of culture, must have speedily disappointed the hopes of their proprietors, although the Borer had never made its appearance. On most estates, too, the system of pruning is improper, and has been the chief cause in inducing a disease called *rot*. This distemper makes its appearance during the rains, when the plants are saturated with moisture, and attacks the leaves, many of which turn black and fall off. Whenever the leaves drop, the berries near their insertion also fall down, and, in this way, as much as 1 or 1½ bushels per acre of crop may be lost. The immediate cause of the disease seems to be the overcrowding of the branches, which prevents the necessary exposure of the leaves, &c., to light and air, and so re-

tards perspiration, assimilation, and the due ripening of wood in the stem and primaries. In some plants affected with rot, I have found the centres of the stems in a state of decay, brought on, no doubt, by the complete stagnation of the circulation. The quantity of weeds allowed to grow on some estates is also most prejudicial to the coffee, and the practice of piling them round the base of the stem when uprooted, highly objectionable. Every English gardener knows how much the gooseberry bushes in a neglected garden suffer from caterpillar, and there is every reason to suppose that a foul coffee estate is equally inviting to the Borer. These several causes, then, have greatly lowered the vital powers of the coffee plant in Coorg, and helped to render it a ready and easy prey to the Borer.

3. Other depressing agencies arose in the droughts of past years, which not only acted most detrimentally on the coffee, but also appear to have produced a peculiar state of the atmosphere, highly favourable for the development of its insect enemies. Throughout the whole of Western Mysore and Coorg, the abundance of wood-destroying insects has, during the past year, been such as to attract general notice; and plants of all kinds, from the Jack to the Bamboo, seem to have suffered from their ravages. The common opinion is, that their appearance in such numbers is an effect of the drought, and this would seem to be the correct one, as there was no other general appreciable cause in operation, and because the explanation is consistent with established facts regarding the influence of atmospheric conditions on insect life. Throughout the whole of 1866, then, the coffee in Coorg was generally in a sickly condition, partly from the effects of causes already referred to, and partly from these of the droughts. At the beginning of the present year, too, the amount of blossom put forth by the coffee was such as had never before been seen by the oldest planter, and, although looked upon by many as a propitious sign, it was doubtless but a symptom of the feeble condition of the plant; as it is a well known fact that plants in a sickly condition often produce an unusual number of flowers. No doubt, this effort on the part of the coffee still further reduced its powers, as no phenomenon of plant-life is more exhaustive in its effects. Altogether, therefore, the coffee plant in Coorg has for some time been in such a weakly state, as would render it peculiarly liable to disease; and during the past twelve months, the White Borer has found in it

a highly congenial field, in which to live and multiply. I shall say nothing of the Red Borer, as, confining itself chiefly to tender branches, it is not nearly so destructive in its operations as the other one, and, besides, it has never appeared in great numbers. For the last few years, occasional specimens of the White Borer have been observed by planters, but it is only of late that they have appeared in such numbers as to cause alarm. At the present moment, I do not believe there is an estate in Coorg free from the pest, while one at least has been rendered worthless, and many more will be in nearly the same condition before the advent of the rains in 1868. In fact, this branch of industry is threatened with complete extinction, and it is very humiliating to think that the cause is a tiny insect, of which a man could crush a thousand between his palms. To enter into the natural history of the insect, were the facts at my disposal sufficient to enable me to do so satisfactorily, which they are not, would, in my opinion, be of little avail; as remedial measures, to be successful, must be directed against the causes that have favored the production and increase of the insect, rather than against the creature itself. Indeed, at first, the operations of the enemy are so insidious, that it is generally impossible to say whether a tree has been attacked or not, and it is only when the work of destruction has gone beyond all remedy that symptoms of what has happened become manifest. The signs of Borers being in a tree are drooping of the younger leaves, and, ultimately, a yellow colour in the whole of the foliage. In advanced stages, the leaves drop off, and, after a few abortive attempts to put forth fresh buds, the plant withers and dies. After the leaves have become yellow, a very slight force will break the stem across, when the tunnels of the enemy, accurately filled with the debris of the wood in a fine state of division, will be observed. These are generally about the diameter of a small quill, and are always confined to the wood, never entering the bark until the larva has done its work, passed through the pupa stage, and is about to escape in the form of a beetle. It is the larva of the insect that is called the Borer, and which proves so destructive in its habits. The eggs from which it is developed would appear to be deposited immediately under the bark of the plant near the ground, by means of a telescopic looking strong ovipositor, with which the abdomen of the female beetle is furnished. It has not been ascertained whether in performing this op-

ration, she takes advantage of one of the numerous cracks in the outer bark, but it is probable that such is the case; as by so doing, she would, without difficulty, reach the tender inner layers which the ovipositor would easily penetrate, and thus place the germs of her future progeny in contact with the mucilaginous *cambium* which would supply them with nutriment, until they acquired sufficient strength to commence tunnelling operations in the wood. The tunnel made by the young Borer is but small (about the diameter of a netting needle), and entirely confined to the sapwood. It does not continue long of that size, however, but gradually gets larger as the insect increases in bulk and strength, and then the hard central wood of the stem is attacked. As the Borer works into the stem, it seals up the passage behind it with the debris of the wood, so firmly agglutinated by some mucilaginous fluid, that it can be removed like a cast of Plaster of Paris on laying open the tunnel. This occlusion seems to be necessary for the existence of the larvæ, for, on laying some of them bare, with the view of watching operations, exposure to light and dry air speedily proved fatal. A considerable number of Borers are generally found in one stem, but although their passages are very intricate and eccentric in their course, the tunnel of one very rarely communicates with that of another. Roots are just as frequently destroyed by them as stems, the larvæ travelling downwards; and when the wood of the stem has become merely exhausted, they frequently strike off into branches. The full grown Borer or larva is generally from $\frac{3}{4}$ to one inch in length, and about the diameter of a quill at the head. The body is whitish, soft, ringed, destitute of feet, thickest in front, and tapers gradually toward the blunt posterior extremity. The head is harder than the body, and furnished with very powerful mandibles. When the larva has completed its term of existence, during the whole of which its entire energy is expended on feeding, it approaches the surface of the stem, and, passing into a state of inactivity, becomes a pupa. How long it remains in this state is doubtful, and all that we know with certainty is that the imago is produced in a cavern prepared for it by the larva in the sapwood, or immediately under the bark, and that, having got through the process of exuviation, it cuts its way out in the shape of a perfect beetle. Instead of living in a dark hermetically closed tunnel, it now exists in light and air, soaring on wings, or

jumping with its powerful legs. It is at this time about $\frac{1}{2}$ inch in length, or sometimes a little more. The head is small, depressed, and furnished with robust mandibles, tapering antennæ, and large brilliant reniform eyes. The elytra are black, and each is marked with three oblique greenish bands, meeting in pairs at their inner extremities when the wing cases are folded, and by a diagonal one at the upper end. The hind legs are long and powerful, and the basal joints of their tarsi are furnished beneath with brushlike appendages. The insect belongs to the tetramerous family of Coloptera or beetles, and will doubtless be soon in the hands of English Entomologists, able to identify it and give a full account of its natural history. We have as yet no reliable information regarding the periods of the year at which the insect is to be found in its various stages of development. In the trees examined by me in September, I found only larvæ. Probably the beetle or perfect insect emerges in the dry season or earlier months of the year, as it would hardly be possible for it to live during the heavy rains of the monsoon. The Borer does not attack dead stems.

4. It will be observed that, through the whole of this letter, I have endeavoured to show that the effect plant in Coorg has been subjected to various debilitating influences, which have predisposed it to disease, and I now wish to say that I look on the Borer as akin to an epidemic. Change in the climate, impoverished soil, and bad cultivation reduced the vital powers of the plant to a minimum, and the severe droughts of past years there, furnished the special influence that caused the pest to increase to such an extent. There is no other rational method of accounting for a scourge that has appeared simultaneously in so many districts so far removed from each other, and under such varying circumstances. At the same time, there is no doubt that, when once the disease has appeared on an estate it will not confine itself to sickly plants, but when these have been used up, extend its ravages to the most vigorous and healthy. That a general debility in the coffee plant has been a powerful predisposing cause is, I think, sufficiently evident from the following considerations:—

(a). Plants purposely or accidentally manured (such as those around coolie lines), and thus in vigorous health, rarely suffer much from Borer; while others in the immediate

neighbourhood, in which this condition is absent, suffer severely.

(b.) Plants on newly opened estates, in which the soil has not been exhausted, escape entirely, or suffer but slightly.

(c.) Plants on dry, barren, and exposed ridges suffer soonest and most severely. Shade does not appear to protect plants from Borer in Coorg, and, although it did, the climate of a great portion of the district is such as to render its use impracticable, the shutting out of light and air by it during the rains, when the plants and atmosphere are saturated with moisture, and the heavy drip rendering the coffee sickly and unproductive. In Bamboo lands, and places where the monsoon is less heavy, however, it may prove useful. I may mention one curious and suggestive fact regarding shade that was brought to my notice by a planter. When shade was talked of some time ago, he tried an experiment on a small portion of the estate, with the charcoal tree (*Sponia Wightii*) to afford shade, and the result was that the charcoal tree was riddled with Borer, while the coffee escaped entirely. The result would seem to support a proposition

enunciated by the late Inspector General, Macpherson, who had given great attention to coffee culture, viz., "that the Borer had attacked the coffee because the trees in which it used to live in the jungle had been cut down." It is quite possible there may be some truth in this, but, at all events, the rearing of belts of the charcoal tree on estates, so as to afford shelter from dry and scorching winds, and give the Borer a less expensive food than the coffee tree, seems deserving of a trial. Farmers and gardeners at home are quite familiar with expedients of this kind for getting rid of the larvæ of insects destructive of fruit trees or crops. I examined the Borer found in the charcoal tree, and it seemed identical with the coffee one. As I have hinted already, it seems perfectly futile to attempt to stop the increase of, or to extirpate, the Borer by doctoring individual trees, and the truth of this will become apparent when we consider for a moment that every acre on an estate contains an average from 1800 to 2000 plants, and that the larvæ live in the interior of the stem. On the other hand, there cannot be a doubt that the complete destruction by fire of every coffee shrub infested with Borer is a most essential preventive

measure, as every Borer permitted to live may produce a beetle, and every female beetle may deposit at least 200 eggs. For stamping out measures of this nature, some combination amongst planters is highly desirable, as a *bored* estate in which such means are neglected, will prove a source of danger to others in its neighbourhood. I think, however, that the efforts of the planter should chiefly be directed towards the introduction of a superior mode of cultivation, so as to get the plants into better condition. A badly cultivated plant, no matter what its nature, is always a ready subject to disease, and one properly treated will yield as much crop as three neglected. In almost every instance, the aim of the Coorg planter seems to have been to get as much land, and put down as many coffee plants as possible, his mind running more on possible returns than the care, trouble and expense that their proper culture would demand. He seems to have entirely forgotten that the richest soils become rapidly exhausted under cultivation, and that if he does not sow, in the shape of labour and manure, he cannot expect to reap. The coffee, too, is an exotic, a garden plant in India, and therefore all the more liable to disease, and requiring careful culture to render it productive. I have already stated that young plants in unexhausted soil, and old ones in manured ground, are, even on infected estates, much less subject to Borer than others in less favourable circumstances—no facts, it appears to me, could be more indicative of the value of, and the necessity for, *high cultivation*; by this, I mean more careful weeding, systematic manuring, and skilful pruning. It may be said that the expense of such changes will preclude their introduction. To this I would reply that one acre carefully cultivated would yield as much as three badly managed. It is also consistent with past experience in matters agricultural and horticultural to say that, if a plant will not pay under high cultivation, it will not pay at all, and the sooner, therefore, its culture is abandoned, the better for all parties concerned. There is no doubt, however, that in favourable localities, and under skilful and liberal treatment, coffee in Coorg will prove remunerative, and the Borer shortly disappear. The manures best adapted for coffee are natural manures, such as farm-yard dung and night soil, guano, lime, bones, and artificial manures, containing alkalis and phosphates. Probably a mixture of natural manure, lime, and artificial manure, would prove the most useful. A gentleman, for some

time resident in a coffee district in Jamaica, informs me that, after five or six years of coffee culture, the land there becomes so exhausted, that the planter uproots the coffee and puts down guinea grass. The coffee planter in Coorg would do well to imitate this system to the extent of substituting guinea grass for coffee in barren portions of his estate, which would enable him to keep a stock of cattle to supply manure, and render him to some extent independent of hired bullocks for the carriage of his coffee to the coast. A large quantity of manure could also, on most estates, be procured by erecting simple latrines on the dry-earth system for the coolies, and I have tried to impress on various planters, that it would pay them well to keep a small establishment of toties, to prepare and store the earth in the dry season, and manage the places. I have been told that coolies refuse to go to latrines; but only the vile places on the old system have been tried hitherto.

5. I hope the importance of the subject may prove an apology for the length of this letter, as an important branch of industry and source of revenue is threatened with extinction, and financial loss of ruin hangs over many hundreds who have embarked their means in coffee estates. I have tried to express my views on the subject as practically and honestly as possible, even although it may be at the risk of offending those whom I am anxious to benefit; and I trust that a residence of some years on the frontier of Coorg, during which I could hardly fail to learn some thing of coffee culture, may at least secure for my remarks a careful consideration.

6. In the Proceedings of the Madras Government, Public Department, No. 107, and Order thereon, No. 1262, dated 11th October 1867, just to hand, I am requested to offer any suggestions that may occur to me with reference to the inquiry about to be instituted by Government regarding the Borer. Of late years, diseases in cultivated plants have become so common in Europe and various British Colonies, as to cause serious anxiety and loss. In the last number of the *Gardener's Chronicle*, there is a leading article pointing out the necessity for appointing State Vegetable Pathologists for the investigation of plant disease, and the writer supports his views by an able paper on the subject from the pen of Dr. Fuchs, and an extract from the *Australian Weekly Age*. It is useless, however,

for me to open up this question, as the Government have already recognized the propriety of such an investigation. It, therefore, only remains for me to offer a few remarks regarding the nature and scope of the inquiry to be instituted regarding the Borer. The investigation should embrace a visit to coffee districts not affected, as well as those infested, with the Borer, and in each instance careful observations and inquiry should be made as to elevation of sites, exposure, nature of soil, quantity and disposition of neighbouring jungle (noting amount of clearing) amount of rain-fall and months during which it falls,

The beautiful "coffee plant," a species of *Strobilanthus*, is believed in Coorg to indicate soil suitable for coffee culture.

temperature and humidity of atmosphere during the several months of the year, prevailing winds, and peculiarities of indigenous flora.* Opinions and facts regarding the effects of

forest destruction on district drainage, climate and vegetation generally should also be carefully collected, as this is a subject of great scientific interest and vast importance in various ways. Localities in which coffee culture has been attempted and failed partially or completely should also be noted, and the causes of the failures ascertained. The state of the coffee plants in the various districts visited should also be noticed, with any peculiarity in the mode of culture. If in a healthy condition, the circumstances to which this is attributable should be ascertained, and, if feeble, or suffering from disease, the proximate causes should be carefully investigated. Disease may arise from vegetable or animal parasites; excess or deficiency of light; air, heat, or moisture; improper culture; or exhaustion of, or noxious elements in, the soil. The nature of the diseases, and their effects, to which the coffee plant is subject will, of course, form the chief points of pathological inquiry; but much light may be thrown on these by noticing the diseases to which other plants cultivated and uncultivated in the coffee districts are liable. It will also be necessary to enter into the nature and mode of application of remedies for the various abnormal conditions. The varieties of the coffee plant under culture and their respective merits, and any signs of degeneracy, should also be noticed. This will lead on to the consideration of the prevalent system of coffee culture in Southern India, and its consistence or otherwise with the established rules of horticulture, based on vegetable physiology. In entering on the special

subject of the Borer, the parts of estates on which plants were first attacked and suffered most, and parts in which they escaped partially or entirely, should be sought for, and any peculiarities as to situation, slope, drainage, exposure, shade, soil, culture, &c., be noticed. At the same time, the natural history of the insect in its various stages, and the nature and extent of its ravages in individual trees and on estates will form subject of inquiry. It would also be well for the Officer deputed to carry out this work to indicate if any parts of the districts coming under his observation would be suitable for the cultivation of other plants, such as tea, cinchona, nutmeg (a wild nutmeg grows in Coorg), cloves, cocoa, vanilla, West India arrowroot, &c., and whether any of these plants might be substituted with advantage in worn-out coffee estates. If the proposed investigation be carried out to the extent that I have thus indicated, and by scientific agency, a vast amount of practical and scientific information will be accumulated, and the Government be in a position, not only to promulgate rules for the prevention and removal of disease in cultivated plants in the Hill Districts, but also to inform the public as to the most profitable system of their culture, and how those planters, presently threatened with ruin, may improve their prospects.

No. 15.—Remarks on Dry Earth Conservancy. By the Sanitary Commissioner for Bengal.

THE following extract from the Proceedings of the Sanitary Commissioner for Bengal for the month of August 1867, has been forwarded by the Government of India, to the Governments of Madras, Bombay, Bengal, the North-Western Provinces, the Punjab; the Chief Commissioners of Oudh, the Central Provinces, and British Burmah; the Commissioner of Mysore, and the Resident at Hyderabad, with the remark that the subject seems to be deserving of attention:—

"Although the dry earth system of conservancy has not yet been authoritatively introduced into Military stations, it has for some time been practically at work in the latrines of most of the European Regiments in the country. Its practical value has been fully established, and its claim to be considered the best form of conservancy yet adopted in this country has been almost universally acknowledged. Under its use the condition of the latrines has greatly improved. Indeed, when carefully carried out, as it is in many

European Regiments, it may be considered as near perfection as any form of conservancy can be. But while the dry-earth system, when thoroughly introduced and properly looked after, promises to keep the latrines in as satisfactory a condition as can be desired, a better mode of disposing of the sewage is much required. Under present arrangements, the night soil is removed in carts to a distance from the Barracks, and buried in deep pits which are dug for the purpose from time to time, and covered over with earth when full. It is a well known fact that sewage buried in this manner takes a long time to decompose and become resolved into its ultimate elements, and during the very long period taken up by this process noxious gases may be evolved through any cracks in the soil, or organic matters may become infiltrated into the water supply. But apart from these possible sources of danger, it cannot be denied that this mode of disposing of sewage is far from being intelligent. An immense quantity of valuable manure in every Military Cantonment is thus thrown away, which might be utilized with the best sanitary and financial results. There can be little doubt that the proper mode of disposing of sewage is to consign it to the soil in such a manner as will allow of its being utilized by plants. It not only is in this manner rendered altogether innocuous, but becomes actually useful, and the natural relation between the animal and vegetable kingdom is thereby preserved. To throw away so much valuable manure is not only wasteful in itself, but also offers a bad example to the Native cultivators. The great difficulty in the conservancy arrangements of Indian cities is to find a market for the sewage. Were the cultivators alive to the actual money value of manure in securing good crops, this obstacle would speedily disappear, and the sewage, instead of proving a difficulty, would become a source of profit. In some parts of the country the Native farmers have learned its value, but these are the exceptions; and when they see that in every Military Cantonment tons upon tons of sewage are literally thrown away, they are not likely to learn that it is really a most valuable product, which can be turned to good account. If a small model farm were attached to each Military Station, the sewage could be utilized, whilst, so far from being an expense, these farms would soon become a source of profit, and would prove centres of instruction in agriculture to the native population. They might be situated on the

outskirts of Cantonments, and might, in many instances, include portions of the Cantonment lands. These are often extensive, and too frequently bare, without trees, and, in certain seasons, there is hardly a blade of grass to be seen on their surface. It is entirely a mistake to suppose that vegetation is inimical to health, and that a place is likely to prove salubrious in proportion to the degree in which it assumes the characters of a wilderness. Mean-Meer is a striking instance of these defects, and it may not be inappropriate to extract here some of the remarks which were made on our recent inspection of that Cantonment:—

“A channel is now being made to convey water from the Baree Doab Canal into Cantonments. The primary object appears to be to provide good drinking water for the men, that of the wells of the station having been generally unfavorably reported on by the Chemical Analyst. But other and important advantages might be secured from this supply. Part of the Cantonment lands might be placed under cultivation. If this were limited to certain crops, and the area to be so employed carefully laid down, no ill effects could arise, and the funds at the disposal of the Cantonment Committee would be much benefited. The water might also be employed for trees and gardens, and the bare arid plain on which Mean-Meer now stands might, to some extent at least, be clothed with green, to the great comfort of the residents, and with no detriment to their health. Nothing can be more depressing than its present appearance. In June 1864, the Sanitary Commission recorded its opinion, that ‘portions of Cantonments, situated at some distance from the quarters of the soldiers and other residents, might sometimes be cultivated with wheat, barley, and other cereals without objection of any kind. I would strongly recommend the question to the consideration of Government. Vegetation, so long as it is not over-watered, nor allowed to become a jungle, is not prejudicial to health; on the contrary, there is every reason to believe that it has a most beneficial influence.’”

No. 16.—Native Doctors for Burmah.

(From Proceedings of the Madras Government.)

Read the following papers :—

From W. A. Green, Esq., Inspector General of Hospitals Indian Medical Service, Lower Provinces, to the Secretary to the Government of India, Home Department; dated Fort William, 16th September 1867, No. 357.

I have the honor to bring to the notice of the Government of India the great difficulty experienced by this office in providing Native Doctors from Bengal for despatch on service to British Burmah. The Native Doctors of this Presidency when so ordered, almost invariably object to go, and make excuses, and fail to comply with orders, and when pushed hard in the matter (if of greater length of service than seven years) they claim the exercise of their privilege of discharge from the service, and this notwithstanding that the pay when ordered to Burmah is increased 50 per cent.

2. This difficulty has been felt for years. The climate does not suit the natives of this Presidency. They very commonly fall ill after a short residence there and are sent back to Bengal wrecked in health. I would submit, for the consideration and orders of His Excellency the Governor General in Council, that this branch of the Medical service, required for Hospital duties in Burmah, should be provided from Madras. The natives of that Presidency are, it is believed, less obnoxious to the hot wet atmosphere of Burmah than are the Hindoostanees. The Medical Department of Madras will very probably allege their incapacity to furnish the required supply upon the ground of paucity of numbers and inadequate fixed establishment. I would respectfully submit that the Madras Government should be authorized to entertain on their permanent Medical establishment a sufficient increase of Native Doctors, so as to enable them to meet the demands of the Chief Commissioner of the Government under this head. I think that the attention of the Chief Commissioner of British Burmah might be directed to the feasibility of setting up a school for the education of Native Doctors at Rangoon upon the model of those at Agra and the Central Provinces.

No. 5086.

Copy forwarded to the Government of Madras, with a request for an expression of opinion.

(By order.)

(Signed) A. H. HARRINGTON,

Offg. Under Secy. to the Govt. of India.

Home Department, Simla,

2nd October 1867.

Referred to the Inspector General Medical Department, for any observations that he may wish to offer.

(Signed) A. J. ARBUTHNOT,

Chief Secretary.

Fort Saint George,

17th October 1867.

From the Inspector General Indian Medical Department, to the Chief Secretary to Government, Fort Saint George; dated 23rd October 1867, No. 414.

Adverting to the letter noted in the margin, forwarded to me for observations under your docket of the 17th current, I have the honour to offer the following remarks.

2. The difficulty represented by Dr. Green in providing Medical Subordinates from Bengal, for service in Burmah, is experienced in an almost equal degree in this Presidency.

3. Subordinates of all grades go there, of course, when ordered; but they almost always go *unwillingly*, in consequence of the much greater cost of living, to meet which they have no increase of pay granted to them, as it appears the Bengal "Native Doctors" have.

4. The climate of Burmah, too, is not less inimical to the natives of this Presidency than to those of Bengal. Medical Subordinates, both East Indian and Native, suffer greatly from it, and very often have to be sent back to the coast in consequence.

5. But even if these difficulties did not exist, it would be impossible just now for this Department to provide the men required, nor do I see any prospect of its being feasible

hereafter. The Principal of the Medical College has intimated, as stated in my letter marginally noted, that he is unable to receive more than 33 Pupils each Session; of these about one-half only can be expected to pass out of the

No. 286 of 17th July 1867, printed in Proceedings of Government, Educational Department, 10th September 1867.

College qualified for the grade of Hospital Assistant, the experience of the last few years having proved that an allowance of about 50 per cent. must be made for casualties, resignations, and failures, and this number is already found inadequate to meet the ordinary requirements of the Army and Civil Departments of this Presidency.

6. I would therefore beg to recommend that the suggestion contained in the concluding sentence of Dr. Green's letter should be acted upon, and that the Chief Commissioner of British Burmah should be requested to take the necessary steps for the establishment of a Medical school at Rangoon, to meet the requirements of the Provinces under his control.

7. In conclusion, I trust I may be permitted to take this opportunity of bringing to the notice of Government the claims of the Medical Subordinates of this Presidency serving in Burmah to a like consideration as is shewn to those of the Bengal establishment. Within the last few days memorials have reached me on this subject, which I am about submitting to Government. I am well aware that to all grades of Medical Subordinates it is a struggle to procure the bare necessities of life in Burmah on their present allowances, and I would most earnestly solicit for them the same increase of pay that is granted to the Bengal subordinates under the same circumstances.

ORDER THEREON, 28th November 1867, No. 1501.

The foregoing papers will be referred to the Director of Public Instruction, with a request that, in communication with the Principal of the Medical College, he will inform Government why only 33 Pupils can be received into the Junior Department of the Medical College in 1868, and what arrangements would be necessary in order to increase by about twenty the number of pupils, either from this Presidency or from Burmah, if natives of that country, capable of receiving instruction in the English language, are willing to come to the Medical College at Madras.

No. 17.—Remarks on the utilization of Chinchona Barks.

By J. BROUGHTON, Quinologist to Government.

(From Proceedings of the Madras Government.)

1. I have the honor of forwarding a Report on the utilization of the Chinchona barks of the Government plantations.

2. In connection with this subject, I am desirous of ascertaining the capability of this part of India of furnishing materials for the manufacture of the febrifuge preparations mentioned in my Report. It appears highly desirable that the natural products occurring in the districts surrounding these hills should be utilized as far as possible in this manufacture, and that, for this purpose, their comparative technical value and cost should be investigated.

3. The most important of these materials are lime, soda, pearlash, magnesia, animal charcoal, acid, alcohol, and their possible substitutes. Among the latter class may probably be found some of the more abundant vegetable products of the Western Coast.

4. I therefore request that Government will be pleased to allow me to visit, on duty, localities in Coimbatore, Mysore, Malabar, and Salem, in order that I may have an opportunity of obtaining practical information on these subjects.

5. Should the Government see fit to grant this, I also beg that I may be accredited to those Government Officers in the above-named districts, who may be able to afford me information and assistance concerning the objects of my journey. I am already greatly indebted to the kindness of Mr. Grant, Collector of Coimbatore, who has provided me with specimens of some important products of the district in his charge. I should also be greatly assisted if Government would be pleased to supply me, henceforward, with copies of papers concerning natural products which might be susceptible of possible chemical applications.

6. If Government should dissent from the proposals advocated in my Report and in this letter, I beg that I may be honored with definite instructions respecting the course they desire me to follow.

REPORT.

1. Among the instructions that I had the honor of receiving from the Home Government,* I am directed to institute investigations for the purpose of enabling Her Majesty's Government to arrive at a decision with respect to the best and cheapest means of preparing the chinchona febrifuge for use among the laboring classes of India. I am also required to consider the questions connected with the manufacture of the febrifuge for the use of Hospitals and Troops in India.

2. It may now, I would submit, be considered as proved that the Chinchona barks of the Government plantations of these hills contain, in at least an equal amount, all the active medicinal principles of the American barks. The utilization of the most economical and effective manner of these extensive plantations, is now the important question to be solved. I believe that this question cannot be too soon attacked. There is now a large number of trees of *C. Succirubra* in a perfectly fit state for furnishing, without injury to the plantations, all the necessary materials that can be required for the manufacture of medicinal preparation for trial, even on a considerable scale. The number of such trees is constantly increasing. By the time that Government has arrived at a decision as to the best method of dealing with this bark, a very large amount will be ready for practical use. I may also observe that the early cropping of some portion of the bark would afford a suitable trial of the practical working of the system of mossing.

3. It appears almost self-evident that, at any rate, the greater part of the cheap febrifuge required for use in this country must necessarily be here prepared. The preparation of the bark for transit, the exportation of so bulky a material, the importation of the alkaloids, are, (as has already been observed by Mr. C.R. Markham)† items of such considerable expense, that it can only be on the failure of every attempt to manufacture in this country that such a course should be adopted. Failure, however, I consider as quite improbable.

4. But it is to be observed that, in order to reduce the total amount of labor entailed by such manufacture and its

* Proceedings Madras Government, Revenue Department, No. 218, December 14, 1866.

† Government Return 1866, page 218.

consequent expense, to a minimum, it will be necessary to depend principally on this country for the supply of the requisite materials, and to dispense, as far as is expedient, with those whose cost of importation would diminish the gain of manufacture on the spot. The preparation of Chinchona bark, that is adopted for extensive medical use in this country must, therefore, combine, as far as possible, the qualities of thorough medicinal efficacy, readiness, and precision of administration, and practicability of manufacture with indigenous materials. In fulfilment of the instructions referred to in paragraph 1, I shall subsequently have the honor of proposing preparations which, while fulfilling in their respective degrees the two latter conditions, will most probably be found to possess the first.

5. The advantage of manufacturing on the spot where the bark grows, is increased by another circumstance. The barks part with their alkaloids more readily when fresh. The usual labor of drying, and subsequently powdering the bark, preparatory to manufacture, is thus rendered unnecessary, while the time and labor required to obtain the alkaloids in a state of solution is reduced.

6. The object I have the honor of discussing is also facilitated by the great addition to our knowledge of the medicinal effects of the several alkaloids, recently contributed in the Report of the Chinchona Commission.* From the evidence adduced in this report, corroborated by the report of the similar Commission in the Bombay Presidency, I believe I am justified in assuming that the four alkaloids occurring in our barks are nearly equal in febrifuge power. Hence, in the manufacture of the alkaloids, it will not be necessary, for ordinary purposes in this country, to separate the quinine from the chinchonine, chinchonidine, and quinidine, with which it is associated. Thus an operation of considerable labor will be avoided, while a much larger amount of product will be available for medical use.

7. Though my own experience in India is limited, and extends over a short period, I have not, I trust, lost sight of the difficulties of detail which must be met and combated before a manufacture of Chinchona alkaloids can be successfully carried out in this country. They are such as would be incident to the initial establishment of any new branch

* Proceedings Madras Government, Revenue Department, No. 302, March 19, 1867.

of industry. It is for this reason, that I would recommend that any manufacture that the Government may eventually see fit to undertake, should at first be on a small scale, and tentative in its nature. It should be extended only when the expediency of extension has been shown by definite results. Its growth might thus be simultaneous with the demand exercised by the gradually increasing yield of the plantations. An extensive chemical manufactory on a European plan would, I think, be anomalous in India, and would not improbably prove a partial failure. But I learn that a manufacture of a somewhat comparable nature (inasmuch as it consists in the separation of a proximate vegetable principle in a colorless crystalline state) is now successfully being worked in this country, though once considered almost impracticable out of Europe. I allude to the manufacture of refined sugar from the cane and palm.

8. The medicinal substances that will be, under various conditions, most suitably manufactured from Chinchona bark are of three kinds : first, crystalline salts of the alkaloids ; second, the free alkaloids themselves in an uncombined state ; third, extracts of the fresh barks for local use. The ordinary pharmacopœia tinctures, &c., of Chinchona can, of course, be made from Indian as well as from Peruvian barks, and need not be considered here.

9. Among the many preparations of Chinchona alkaloids that have been adopted since their discovery, the crystallized sulphates have obtained the most extended use. Their special merit consists in the fact that, while they are comparatively easy to prepare, their crystalline form ensures, within certain limits, both purity and uniformity of composition, and hence *ceteris paribus*, constancy of medicinal effect. Many other crystalline salts have, at various times, been proposed, which possess special advantages, but on the whole (with the exception of hydrochlorate of chinchonine) have not been advantageously re-placed in general practice. The proved efficacy of sulphate of quinine, and its long continued use, induce me to believe that it must, to a certain extent, be always employed in medicine, even should other preparations supersede its now almost universal use. It appears, however, to be very probable that should the sulphates of the alkaloids be ever extensively manufactured in this country, that the sulphates of the mixed alkaloids, as they occur in

the bark, would be found most expedient to prepare. The sulphate of quinine would be thus mixed with the sulphates of chinchonidine and quinidine. I have the honor to forward a specimen (No. 1) of such a salt which, with the exception of the sulphuric acid it contains, has been exclusively prepared from indigenous materials. Its efficacy follows as a direct inference from the results obtained by the Chinchona Commission.

10. A preparation that I would now recommend for the consideration of Government, as offering considerable advantages, is that of the alkaloid precipitated from solution in an amorphous state. During the last five months, I have spent much time in endeavouring to find a process which would yield the alkaloids in a state of sufficient purity by simple means. The specimen (No. 2) which I have the honour of forwarding, is prepared by a method which an ordinary Apothecary would have little difficulty in learning to follow. It is comparatively inexpensive, and it could, I believe, be adapted to the means of all the smaller Government plantations, and would thus enable them to become centres of supply of the febrifuge for the district in which they are situated. The preparations would be most conveniently administered in the same dose, and in precisely the same manner as sulphate of quinine, namely, by dissolving in dilute acid. It may also possibly be found to possess some advantages of its own (see Appendix, paragraph 7.)

11. Should the Government see fit to entertain such a proposition, I would suggest that some medical experiments be made with this substance, which I will supply, at first in small quantities ; if it prove successful, I would then, with the sanction of Government, extend the manufacture, and, as opportunity offers, include that of crystalline sulphates. By such a mode of proceeding will, I believe, the subject of the utilization of the plantations be most conveniently placed on a practical basis.

12. The best form in which the febrifuge can be prepared on the spot for use by the owners of a few trees, has also occupied my attention. This will almost necessarily be a liquid preparation. At the suggestion of the Principal Inspector General Medical Department, some trials will be made on this subject by Mr. Wade, the gentleman in charge of the Dispensary at Goodalore, in Wynaad, to whom I will supply the necessary material.

13. I shall shortly have the honor of communicating a report on some other results to which my work has been directed. The above being connected only with a special part of my duties, I have thus, to avoid delay, taken the liberty of making it a separate communication.

APPENDIX.

1. I here take the opportunity of suggesting some circumstances connected with the chemical history of the barks and alkaloids, which appear to me to corroborate, in an interesting manner, the results arrived at by the Chinchona Medical Commission.

2. Mr. Howard has already pointed out the fact that the famous cure of the Countess of Chinchon was effected by a bark whose main febrifuge constituent was chinchonidine.*

3. Quinine was discovered in 1820, from whence its use in medicine commenced. Chinchonidine was discovered by Winckler in 1845. Quinidine was first identified by Van Herjningen in 1849. The two latter alkaloids were, however, very generally compounded with each other, and called by the common name of quinidine. It was not till Pasteur, in 1853, clearly distinguished the two alkaloids, and ascertained their true composition, that our knowledge of these important substances attained precision.

4. The consideration of these facts leads to the conclusion that, at least for thirty years, much of the commercial sulphate of quinine employed in medicine would inevitably from the method employed in its manufacture, be largely mixed with the sulphates of quinidine and chinchonidine, without their presence being suspected, and would occasionally consist entirely of the latter salts. The test now generally employed to ascertain the purity of sulphate of quinine did not come into use till the year 1854. Hence, during the period that quinine gained its reputation as being the first of febrifuge medicines, it was constantly liable to large admixture with its associated alkaloids. Had the latter not possessed similar medicinal properties, the high reputation which now attaches to quinine must necessarily have been greatly modified.

* Government Return 1866, p. 135, and Nueva Quinclogia of Pavon, sub voc Chuarguera.

5. Pereira (*Materia Medica*, Ed. 1857, vol. 3, pp. 132, 133) bears, from his own practice, unequivocal testimony to the efficacy both of chinchonine and the then called quinidine. He also quotes the opinion of many authorities in support of this fact.

6. The chemical constitution and properties of the four several alkaloids of chinchona singularly resemble each other. Quinidine and quinine are identical in composition, and unite with acids in precisely the same proportions. The same is the case with chinchonine and chinchonidine, and they differ but slightly from the former pair in composition. The similarity in their therapeutic action is thus in harmony with their other properties. Among the very numerous alkaloids of opium, where a far greater divergence in composition and properties occurs, the physiological action of the various numbers differs widely from each other, as has lately been well shewn by the experiments of Claude Bernard.

7. I observe in the interesting report of one of the members of the Chinchona Commission, it is stated that the administration of chinchonidine has a tendency to produce nausea and vomiting. This has been also found by some earlier observers to have been the case with chinchonine. The taste of the salts of these two alkaloids, though greatly resembling that of quinine, has in addition a disagreeable after-taste, which becomes on a second dose particularly sickening. It appears probable that, should the effect alluded to by Mr. Chipperfield, be a frequent consequence of the exhibition of chinchonidine, it may be ascribed to this cause. I would suggest that it could be remedied by administering the chinchonidine not in the state of solution, but in the form of the free alkaloid, either as dry powder, or diffused through water. The alkaloid being but very slightly soluble has but little taste. As it would probably be desirable to make a few experiments on this subject with patients on whom the sulphate produces vomiting, I beg permission to forward some chinchonidine, nearly pure, which has been prepared from our Red Bark.

8. I here also take the opportunity of mentioning a circumstance which might, unless corrected, modify in some degree the results obtained in a strict quantitative comparison of the therapeutic effects of the sulphates of the respective alkaloids. These sulphates, when crystallizing from

solution combine with different amounts of water. Thus, unless it should so happen that the precaution has already been taken of drying the sulphates at a steam heat, (which would destroy the beauty of the crystals), they will thus contain variable quantities of water, and, as a consequence, the same doses may really contain somewhat different proportions of true alkaloid, which is of course the curative substance.

Thus the normal crystalline sulphates contain of water as follows :—

Sulphate of Quinine contains 14·9 per cent of water.

Do. Quinidine do. 12·8 do. do.

Do. Chinchonine do. 4·7 do. do.

Do. Chinchonidine do. 16·9 do. do.

Commercial samples, even if quite pure, may contain variable amounts of water within the above limits. Whether this circumstance obtains to a sufficient extent to affect the present experiments of the Chinchona Commission, I am not competent to say.

(Signed) J. BROUGHTON.

ORDER THEREON, 13th December 1867, No. 2,968.

1. The Government have perused with much interest Mr. Broughton's Report on the utilization of the Chinchona barks of the Government plantations, and fully approve his proposal that he shall proceed into the districts adjoining the Hills in order to investigate their capabilities for furnishing the requisite materials for the manufacture of febrifuge preparations. The Collectors of Coimbatore, Malabar and Salem will be instructed to afford him every assistance in his researches, and the Government will request the Commissioner of Mysore to ensure him all due facilities in the Mysore territories, when the pursuit of his investigation may take him into that country. The importance of the object in view can scarcely be overrated.

2. The Government will be prepared to place the services of a competent Interpreter at Mr. Broughton's disposal to accompany him on his tour, and request him to communicate with the Collector of Coimbatore in view to the selection of a properly qualified person for the duty, unless Mr. Broughton can himself name any one whom he would

prefer to employ. The Inspector General Indian Medical Department will instruct all Officers of his department in the districts named, that the Government rely on their co-operating with Mr. Broughton to the best of their ability, in any way consistent with the discharge of their regular duties, which may seem calculated to promote success in the attainment of the object in view.

3. The Government would recommend to Mr. Broughton's attention some inquiry into the native remedies for fever, and into the medicinal properties of the Barks of indigenous trees and other vegetable products of the country.

4. His request to be furnished with copies of papers concerning natural products susceptible of possible chemical application, will be attended to as opportunity may offer.

5. The specimens of the sulphate of mixed alkaloids and of the amorphous alkaloid, mentioned in paragraphs 9 and 10 of the Report, will be forwarded to the Inspector General Indian Medical Department with reference to paragraph 11, for his remarks, and for such trial as, in communication with his colleagues in the Chinchona Commission, he may consider most suitable to test the efficacy of the preparations.

6. The Government authorize Mr. Broughton to draw a travelling allowance of Rupees 7 a day while absent from his head-quarters, on the duty which he has volunteered to undertake. He will report what camp equipage he will require, which the Government will provide. They will await with interest his report of the results of his inquiries.

No. 18.—*Report on Cattle disease in the Madras Presidency.*

By J. THACKER, Veterinary Surgeon, Madras Army.

(From Proceedings of the Madras Government.)

(I.)

REPORT.

Since I furnished my last report, I received a communication from the Collector of Coimbatore, forwarding a letter reporting the existence of disease among cattle at Coonoor; also a letter from the Collector

of Trichinopoly to the same effect. Intelligence, however, reached me at this time, from the "Sub-Collector of Madras, of two diseases called by the natives "Nir Vekkai" and "Anal Vekkai," in the latter of which the animal attacked was stated to break out with a pustular eruption over the body. Believing this form of disease similar to, if not identical with, that referred to in paragraph 13 of my report, dated 17th May 1864, as "most prominently dwelt on in all the printed reports," and being one which I had hitherto had no opportunity of witnessing, claimed my first attention. There appeared to me to be an opening for a series of experiments in inoculation, such as had never hitherto been carried out in this country, and for which no opportunity presented itself at home during the late cattle plague. Bearing in mind the orders of Government on this subject, expressed in Proceedings above quoted, and not considering former experiments in inoculation, conducted by me, and detailed in my report of 2nd March 1866 either sufficient or complete, I was the more anxious to take advantage of this occasion. It was my intention, therefore, at once to proceed to Madras, thence to visit Trichinopoly, and finally Coonoor. In consequence, however, of the receipt, at this time of a notification that my services would be required at Oosoor on the 4th March, I was only able to visit the Madras District.

Although no time was lost inasmuch as I started for Conjeveram immediately on the receipt of the report from the Sub-Collector of Madras, on arriving at that station and on the Sub-Collector's making further inquiries we were sorry to find that the disease reported from Pennakur and adjacent hamlets had apparently ceased to exist, not before, however, it had carried off about 300 head of cattle.

Having been unable, for the reasons above quoted, personally to examine into the disease reported by the Collector of Trichinopoly, which was a fever of a typhoid character, I gave him all the assistance I could in writing, and stated that, should the sickness continue, I would visit the district at the earliest opportunity.

Intimation was received from the Collector of Bellary of the existence of cattle disease in the Anantapur talook; the extent of its prevalence was not, however, mentioned. A written plan of instructions was forwarded, and further information requested. No communications having since been

received on this subject, I am led to conclude that the plan was successful.

At this time I was informed by letter from the Collector of Coimbatore of an outbreak of murrain in Collegal; but he could not, on account of the unhealthy nature of the country, recommend my visiting it at that season of the year. I sent medicines, and despatched written instructions for treatment, and the adoption of measures calculated to check the spread of the disease, with a request that I might be kept informed as far as practicable of its progress, and result of the measures adopted.

From Conjeveram in obedience to orders, I proceeded to Oosoor, and conducted my duties in connection with the Remount Commission there.

I now visited the villages of Chittoor, Attapaukum, Pannavaram, Manavantangal, Killandury, Nagavadoo, and Pallaveram in the North Arcot District, for the purpose of eradicating a sickness called "Vekkai," a type of Rinderpest, which had been reported by the Collector. In furtherance of the object of my visit, and with the view of influencing the ryots to carry out any directions which it might prove necessary to give, the Head Assistant Collector kindly accompanied me through these villages. We learned that the disease had advanced steadily from east to west, commencing at Chittoor, proceeding through Pannavaram, Attapaukum, Manavantangal, and Killandury to Nagavadoo. The impression of the people was that this disease came with the longshore or south-easterly wind prevailing at this season; which would imply that it is of an epizootic nature; they were well aware of its highly infectious or contagious character, and therefore the more readily assented to the plan of segregation which we deemed it necessary to enforce. Out of 330 animals attacked 250 had died, fifty recovered, and for the remainder, in various stages of the disease, the plan of treatment as laid down in my pamphlet was recommended and medicine supplied. On visiting Pallaveram, where the same disease existed, I found a striking decrease in the rate of mortality (of 128 cattle attacked sixty-five had recovered), arising from the greater care taken by the people of this village in supporting the strength of the animals with frequent draughts of gruel. Here also medicine was left and segregation recommended.

Thence I proceeded to Coonoor, and had an opportunity

of making two *post-mortem* examinations of animals which had died of the disease on the Hill Grove Coffee Estate, where of fifty cattle twenty-nine had been lost. From the appearances I was led to conclude that the predisposition to the sickness was an impoverished condition of blood, which induced derangement of the digestion; but there appeared to be nothing of an infectious or contagious nature, neither did I consider the disease of a character such as would not be remedied by some simple corrective. In the only then remaining cases I recommended small doses of common salt, and suggested that the same should be periodically administered to the herd, the result of which treatment has since been reported as most successful. I would here beg to remark that I am satisfied that to a deficiency of saline matter in the soils of these hill ranges, the impoverished and deteriorated condition of cattle and sheep, and the frequent occurrence of diseases of this nature, are in a great measure to be attributed, and would, therefore, strongly recommend this method of prevention of disease to the notice of owners of cattle and sheep on the Neilgherry Hills.

On my return, receiving reports of sickness from the Collectors of Cuddapah and Coimbatore, and the Sub-Collector of Madras, I took this opportunity of again visiting the scene of former outbreaks in the district of North Arcot, en-route. The directions given on the occasion of my former visit here proved to have been of the greatest benefit. In the villages of Chittoor, Attapaukum, Punnavaram, Manavantangal and Nagavadoo, the disease had entirely ceased, while at Killandury only three cases were extant, and in these the animals were suffering more from debility consequent on the attack, than from the disease itself. At Pallaveram again, owing to the prompt action taken on my advice of segregation, only two fresh cases had occurred, and both had recovered under treatment. Of the seventeen animals sick on the occasion of my former visit, nine had recovered, seven had died, and one remained laboring under merely resulting debility.

In compliance with the request of the Sub-Collector of Madras, I proceeded to visit Pullaloor, where it was reported that a sickness called "Addapan" prevailed; but on arrival at Pullaloor, was met by the Tahsildar of Conjeveram, who informed me that this sickness was now extinct. At Pullaloor, however, I learned that a disease of

a serious character had just broken out, and immediately proceeded to visit that village. This I found to be "Vekkai." Twelve animals appeared to have died already. I examined thirteen in different stages of the disease, left medicines for them, and directed the same treatment and preventive measures to be adopted, as had been carried out with such good effect in the villages of Chittoor, &c.

In the district of Cuddapah, which I next visited, the existence of a disease called by the natives "Saraku" had been reported. This disease, it would appear, had been prevalent for about a month, but was only brought to the notice of the Deputy Collector by a villager, when the former was making the settlement of Mudiredipully, and there being nothing in his report to lead me to suppose that the disease was abating, remarking, moreover, that no medicine was given, and that 100 animals had fallen victims, I considered a visit to that village important. On arrival, however, there were only a few remaining cases in an improving condition, and no fresh attacks had occurred for several days. I perceived this to be an infectious type of inflammatory disease, supposed by the natives to be close allied to the "Peddamoosarogum" reported upon in 1864, but of not so acute a character. On investigation it was found to have originated from the cattle of this village being permitted to pasture on land where infected cattle of the village of Cattapully, a hamlet of Tepereddipully, had lately been grazing, but of its origin there, I could obtain no information. Of 105 cattle attacked, only twenty recovered, where no medicines were used or preventive measures adopted; but since the disease seemed now to be abating, I deemed any further stay unnecessary. Leaving, therefore, medicine for the cattle that still remained sick with the village authorities, and intrusting to the Deputy Collector and Tahsildar supplies and directions in the event of another outbreak, I communicated to the Collector the result of my investigation, detailing the medicines and treatment which I found to be beneficial in cases of this nature.

En-route to Kongiem in the Coimbatore District, whence sickness had been reported amongst the cattle and sheep, I arrived at Arconum where I was met by a Revenue Inspector, who informed me that the village of Pallaveram was now clear of sickness, but that "Vekkai" had just made its appearance in the village of Perithipatoor. On reaching this

village I saw eight sick animals, seven of which had been placed by the natives themselves under my system of treatment, receiving medicines from the supply which had been left with the Revenue Inspector; these were fast progressing towards recovery, but the remaining case, the owner of which had declined to make use of these remedies, was in a condition likely to terminate in death. I gave further supplies of medicine both to the Monigar and Revenue Inspector, and wrote to the Acting Head Assistant Collector of North Arcot, requesting his official assistance in persuading the people carefully to adopt the measures of segregation, the importance of which I had strongly insisted on.

On arrival at Kongiem, I proceeded to Veranampollium, the then affected village, as I learned that at Cadyoor and surrounding hamlets the disease had ceased. Of 1,000 cattle belonging to these villages, eighty had been attacked, six only had died, and there now remained but five cases. On examination of these, which were in a state approaching towards convalescence, I found the disease to be of an enzootic febrile character, resulting in all probability from climatic causes, the most prominent of which I opine to have been the very dry state of the atmosphere, and the consequent absence of succulent forage. I had no reason to suppose it either contagious or infectious, and being confident that no further extension was to be apprehended, I left medicine and directions for the sick cattle and a supply in the event of any other cases occurring. From a further communication, I learned that the sick cattle had all recovered under treatment, and that the disease had ceased to exist. The natives apply the same name, "Alarinnovoo," to this disease both in cattle and sheep, but in the case of the latter, where, of about 1,500, 130 had been attacked and fifty had died, I consider this larger percentage of deaths to result from the objections of the shepherds to pursue any course of treatment, and the comparative inability of the animal to withstand disease, not from the disease being of a more severe character. With the knowledge that were medicines left they would not be made use of, I could only recommend change of pasture.

Communications were received from the Deputy Collector of Cuddapah, announcing the outbreak of a disease called by the villagers "Goondanusara" in the Jamalamudugu talook. From this it would appear that he was making

use of the remedies left by me for the cure of "Saraku" as above reported, but as I considered these inapplicable, I telegraphed to him to discontinue them, and forwarded medicine of another class, which I deemed more suitable for this complaint. Owing to the prejudices of the natives of some of the villages, the medicine did not receive a fair trial, although the Deputy Collector appears to have used his utmost endeavours in the matter. Where tried, upwards of sixty-five per cent. of cases recovered, but in consequence of its use being confined to a small number, no reliable conclusions regarding its efficacy can be drawn.

From the Acting Collector of Nellore a description was received of diseases of different types affecting the cattle of his district. Although each disease taken separately might not have called for any special notice, yet, when in the aggregate it appeared that 400 cattle had died out of 2,600 in the town, I should have considered my personal assistance desirable, had not a letter reached me at this time requesting me to attend some camels belonging to the Commissariat at Bangalore, amongst which an epizootic had broken out. These, as Government property, claimed my first attention. For the principal and important diseases at Nellore, the nature of which I was enabled to recognize from the descriptions furnished me, namely, "Sarakuthegalu" and "Pillisara-kulu," I forwarded medicines and directions for treatment, while of two other diseases "Epizootic Aphtha" and "Malignant sore-throat," (named by the Collector respectively "Gallikundu," and "Nerida,") my opinion and recommendations had already been placed before Government, and by the request of the Revenue Board, had been translated into the vernacular, and published in the *District Gazette* for the information of the people. Four other diseases were mentioned, namely, "Musara," "Romarogum," "Gudipettu," and "Mukkuchedalu," but of none of these could I, without opportunities of personal investigation, form a sufficiently distinct opinion to warrant my laying down a course of treatment. At first, the medicine sent was tried at Lebur without any apparent benefit, whereas, in Nellore itself, the effects were so beneficial as to establish a confidence in its use. Later, however, I was informed that, when the attack had gone beyond a certain length, the medicine had but little effect, and the Collector regretted that a want of general success had prejudiced the ryots against the use of it. He remarked, however, that the disease was disappear-

ing—with the advent of rain, and consequent abundant pasture.

With reference to the reported epizootic amongst the Government camels, on visiting them I found seven animals suffering under various affections. I learned that since the commencement of May seven camels had been lost, and had an immediate opportunity of making a *post-mortem* examination of one which had died the day previous. In this animal I observed a considerable amount of chronic disease affecting the digestive and respiratory organs generally. The liver was much enlarged and softened, containing numerous hydatids, the stomach and bowels of a pale unhealthy color; in the abdominal cavity were also observed false adhesions and considerable effusion of serum. The same character of dropsical disease was found in the organs of the chest, the lungs being also congested and partially adhering to the sides and infested with hydatids in the same way as the liver. Of twenty-three animals which came under treatment seven died, and appearances similar to these were observed throughout the *post-mortem* examinations conducted by me. From these evidences, and on further treatment of the sick animals, it was apparent to me, that the disease under which they were laboring possessed nothing of an infectious character. Although the symptoms differed considerably in different animals, the form of disease was the same throughout, and that one to which a robust animal would not have been subject in the same degree, but constant exposure to changes of atmosphere and weather from want of cover had so weakened the constitutions of these animals, indigenous to a dry hot climate, that they were rendered more liable, and succumbed the more readily to such affections. Where in a strong animal such diseases would have been withstood, in these they resulted in entozoic formations in almost every organ, reacting as remote causes to other attacks. Seeing that in cases of this nature there is but little scope for curative treatment, it becomes the more important that the constitution of this naturally delicate animal should be guarded as far as possible, and with this view I would beg strongly to advocate the course of cover being provided for them, and measures being taken to protect them, as far as possible, from sudden vicissitudes of weather.

My immediate attention and personal presence on the Hills

was deemed desirable by the Collector of Coimbatore in consequence of an outbreak of sickness at Kaity, called by the villagers "Kudinow," closely allied to "Pytelinow," by which name they designate Rinderpest. On my arrival I was met by the Special Assistant Collector, and by his kind co-operation was enabled at once to proceed to investigations. On conducting a *post-mortem* examination of an animal which had died of the malady the previous day, I noticed, it is true, the absence of certain appearances which shew themselves in true Rinderpest; but since, in almost every particular, the symptoms noted in the progress of this disease correspond with those apparent in Rinderpest, I attribute the absence of these appearances more to the influence of season and climate, than to any difference in the type of the malady. It is essentially a disease of a low febrile character, infectious in the highest degree, insidious in its attack, making considerable progress before any outward signs lead to apprehension on the part of ordinary observers. The appetite continues but little affected for the first three or four days, a dulness about the animal, a slightly heightened temperature of the body, (only perceptible, however, by the use of a thermometer,) and a somewhat rougher appearance of the coat being the premonitory symptoms. These are followed by shivering fits in the colder parts of the day, but they are unattended by the peculiar twitching of the muscles of the neck and flank observed in Rinderpest. The further progress of the disease is marked by entire loss of appetite, an increase of temperature over the body, now apparent to an ordinary observer, drooping ears, coldness of the extremities of the horns, ears, and legs, evacuations indicative of defective digestion, pulse full, ranging from 60 to 80, and in occasional cases to 90, slight congestion of the lining membranes of the eyelids, and rumination only occasionally and imperfectly carried on. The last stage is ushered in with diarrhoea, the evacuations being of a very watery character, and in occasional instances mixed with blood. The pulse loses power, being almost imperceptible excepting at the heart, but continues unaltered in number, respiration becomes quickened, temperature of body suddenly falls several degrees below the healthy standard, patient becomes restless, weakened, often lying down, the eye sunken, the countenance anxious, the senses somewhat aberrant. Of the origin of this disease in Kaity, the only traces that I have

been able to gather are that in Malleada, in the early part of May, the whole of the cattle (only twelve in number) were found to be sick. Not till the 12th July, however, and then only from a private source, did information reach me of this outbreak which had by that time much extended, and I then communicated by telegram with the Civil authorities who had up to that time been kept in ignorance of the sickness. The cattle of Malleada so attacked were kept separate from those of other villages, but were still allowed to graze on certain land. Those of Kaity being afterwards taken to pasture on the same ground contracted, I have no doubt, the disease in this manner. Here preventive measures to a certain extent were early adopted. Immediately on the disease making its appearance, the affected cattle were separated, and the healthy portion of the herd taken to Doda-betta. Of 140 animals so separated, forty were driven further than the rest and kept isolated, and amongst these no sickness occurred, but with the remaining 100 the same care as regards isolation could not have been taken, inasmuch as in the course of a fortnight one case occurred, eventually the whole 100 were attacked, and seventy animals were lost.

This sickness is now, I regret to state, extending to the village of Kandal, and a few cases have occurred in Ootacumund; but being on the spot at the very commencement of the outbreak, I trust that much may be done to check the malady. Where cases have been reported immediately on the animal sickening, the disease has been found to yield to treatment, but, as above stated, the insidious nature of this disease is such as readily to mislead any unpractised person, the latter stages set in rapidly, and medicine can be of but little avail when the strength of the animal is exhausted and the disease at its height, even where the malady is checked, the patient will, in many cases, succumb from sheer weakness.

Having experienced difficulties in ascertaining, with any degree of certainty, the exact nature of a disease when first reported, and having, consequently, felt some hesitation in deciding which of several outbreaks, reported simultaneously from different parts of the Presidency, should receive my first attention, I would beg to suggest the distribution of papers containing the questions below noted. If the answers to these be filled in and forwarded on the first appearance of

sickness, it would much facilitate my arriving at a just estimation of the character of the malady, and enable me the better to come to a decision as to the necessity, or otherwise, of my presence on the spot:—

Questions.

1. Name of District, Talook and Village.
2. Name of Disease, Native or English.
3. Date of outbreak of disease.
4. Number of Cattle attacked with the disease.
5. " of " died from the disease.
6. " of " recovered from the disease.
7. " of " remaining now sick.
8. " of " belonging to the village.
9. Is the disease infectious?
10. How supposed to have originated.
11. Describe the symptoms, giving information on the following points: external appearance of coat, rough and dull; skin, tight; vesicular, or pustular eruptions; body, hot, and extremities of horns, ears and legs cold; nose moist and cool, or hot and dry; eye dull or bright; animal dull and sleepy, or restless and wakeful; changes in quantity or appearance of urinary and fecal evacuations; defluxion of mucus from nose; weeping from eyes; saliva from mouth; cough; quickened or labored breathing; color of lining membrane of eyelids, pale-pink, dark-red, or yellow; swelling of throat, or difficulty of swallowing; shivering fits.
12. Average duration of attack before recovery or death.
13. What preventive measures are used?
14. What medicinal treatment adopted, and, if so, with what result?

In conclusion, with reference to Order of Government, 16th July 1867, No. 1,578, I would beg to state that, in my opinion, it is very desirable that a Veterinary Surgeon should still be employed in inquiring into, and suppressing, the several different forms of cattle disease in this Presidency. I am confident that the greater number if not all these diseases are amenable to treatment, and it has already been clearly shewn that, where villagers understand and strictly carry out preventive measures, the utmost benefit is reaped. For any but an experienced Veterinary Surgeon to attempt to lay down a plan of treatment with any hope of success is impossible. In this country more than in England, the same

sickness is found to vary so much, in some cases from difference of climate, in others at different seasons of the year, that even to attempt to lay down a fixed plan of treatment to be always adopted for a particular disease, would, in many cases, prove vain, inasmuch as varied symptoms must call for modified treatment. Again, I do not think that a Veterinary Surgeon doing Regimental duty could give satisfaction either to himself or the Government, since delay must inevitably occur before he could reach the scene of outbreak, and, in many instances, it might happen that his services could hardly be dispensed with.

(II.)

Letter from the Collector of Coimbatore, to the Secretary to the Board of Revenue, dated 24th September 1867, No. 251.

1. I have the honor to forward, for the information of the Board of Revenue, an original report of Dr. Thacker, on a late outbreak of murrain in Ootacamund and the neighbouring villages. The type of disease seems to have been most malignant; both cows and buffaloes have suffered.

2. A fair amount of success has attended the segregation of the sick animals from those not attacked.

(III.)

From Veterinary Surgeon J. Thacker, to the Collector of Coimbatore, dated Bangalore, 21st September 1867.

1. In reference to your letter, No 205, dated 18th July 1867, with enclosures from Acting Special Assistant Collector relative to reported outbreak of Rinderpest at Kaity, I have now the honor to report the results of the inquiry and treatment.

2. The sickness is called by the people "Kudinow," considered closely allied to "Pytebinow," that form of Rinderpest reported in your letter, dated 9th March 1866, No. 63. Some prominent diagnostic features differ in these two diseases, yet, I consider them but variations, or modifications, of one malady. The structures attacked, the highly contagious nature, the progress, duration, and fatality correspond with each other in both affections.

3. The disease broke out at Malleada, a village in the Kaity valley; these animals, twelve in number, were kept separated from contact with all others; but after their death, the cattle belonging to Kaity village were allowed to graze on the land where the sick had been daily driven, and thus the disease spread. For the Kaity cattle, 140 in number, preventive measures were attempted; 100 were removed to Dodabetta, forty to a further distance; of the 100 all were eventually attacked and seventy died, while the herd of forty entirely escaped. For future guidance I would point out that I consider the herd removed to Dodabetta should have been placed in Kraals (containing from ten to twenty animals only) 200 yards apart, and attended by persons exclusively appointed to each particular kraal, and no communication allowed with each other.

4. The disease next appeared in Kandal and Ootacamund. The crowded state of cattle in sheds, the scarcity of buildings, the inability of many of the animals to withstand exposure to the prevailing monsoon weather, were grave obstacles to effectively segregating sick, and dispersing the herds in which disease had appeared, the latter more difficult from the disease existing in places scattered and remote from each other. I am happy to state, nevertheless, with all these difficulties, that from the kind co-operation of your officers there, that the results were eminently gratifying. Of 660 cattle in the immediate vicinity, twenty-three cases occurred, and only twelve animals died.

5. In addition to these, however, the disease was contracted by a herd of Todahs' buffaloes in the neighbourhood. On my immediate advice the animals, fifty in number, were removed to a secluded unfrequented place on the hills, placed in four kraals 200 yards apart, each detachment, with attendants, being perfectly isolated; the sick were removed and kept together by themselves; the result being that twelve only were attacked, nine died, and three recovered. Medicinal remedies were offered but declined, beyond the administration of a few doses; as there was a seeming want of confidence in their use, and as, under this exposure to the vicissitudes of the monsoon weather, I could not fairly hope for success in treatment, the attempt was not pressed upon them.

6. Having remained beyond the period of incubation of the disease without further cases occurring, I deem my further stay unnecessary, the disease being extinguished.

(IV.)

REMARKS BY THE BOARD OF REVENUE.

1. Resolved that the foregoing papers be submitted for the information of Government.

2. The first paper is Mr. Thacker's report upon his treatment of the cattle diseases which have prevailed in different parts of the Presidency during the past six months, and the other is a special report to the Collector of Coimbatore on the outbreak of a disease among the cattle in the Neilgherries with Mr. Grant's remarks thereon.

3. The Board consider that Mr. Thacker has, upon the whole, been very successful. It is evident that the greatest difficulty under which he labors is the late date at which information as to the outbreak of disease usually reaches him. This, however, may easily be surmounted if all Officers in charge of Revenue Ranges require an immediate report from their subordinates, in the form proposed by Mr. Thacker, when disease first appears among the cattle of any particular locality.

4. The Board propose that the Range Officer should communicate the report, with his own remarks, immediately on receipt, to Mr. Thacker, forwarding a duplicate copy the same day to the Collector. In emergent cases, when Mr. Thacker's immediate presence appears to be necessary, it will then be in the Collector's power to communicate with him by telegraph.

5. The Board quite concur with Mr. Thacker in considering that his employment on his present special duty is highly desirable. They are of opinion that the valuable information which he is acquiring will eventually be of the greatest service in preserving the agricultural stock of the country on which the prosperity of the people so largely depends, and they are satisfied that each season the confidence in his system of treatment will increase, and its adoption will become more general.

(V.)

ORDER OF GOVERNMENT THEREON, 12th November 1867,
No. 2,667.

1. The Government concur in opinion with the Board that Mr. Thacker's report is satisfactory, as indicating

progress in combating cattle disease, and the growing confidence of the people in his mode of treatment.

2. Under the circumstances stated, Mr. Thacker's continued employment on this special duty is evidently desirable, as calculated to produce very valuable results to the agricultural class, so largely predominating in this country.

3. The Board will impress on the Collectors the importance attached by Government to this investigation, and call on them to stimulate all their subordinates to furnish Mr. Thacker with the earliest and fullest information of the outbreak of disease as nearly as possible in the shape desired by him. Blank copies of the printed form of report, with headings in English and the vernacular, and addressed to Mr. Thacker at his head-quarters, should be widely distributed in the talooks, and instructions given that one copy should be forwarded direct to Mr. Thacker, and a duplicate to the Collector immediately on the existence of a well-marked type of disease becoming known to the local officers.

4. The Government thank Mr. Thacker for the attention he has devoted to the subject, and for his report now submitted.

5. He is of course recording the results of his experience, and the Government request him, when in a position to do so, to draw up a short and simple Manual describing the different forms of disease, the more prominent symptoms, the proper treatment, the suitable and most easily procurable medicines, and the appropriate doses, with such further observations as may appear to him calculated to check the originating and spread of disease.

6. A simple Manual of this kind, translated into the vernaculars and widely circulated among the people, seems calculated to produce results of the utmost value.

7. The Board will communicate Mr. Thacker's report to all Collectors.

No. 19.—*Reports on the Causes of Death in Madras for the Second, Third and Fourth Quarters of 1867.* By HOWARD B. MONTGOMERY, M. D., Secretary, Sanitary Commissioner.

(I.)

(SECOND QUARTER.)

THE health of Madras during the second quarter has in some respects not been satisfactory. An examination of the following tables shews that the total number of deaths amounted to 2,925, which, contrasted with the mean (for ten years 1857 to 1866) of similar quarters 2,582, shews an increase of 343.

This calculation, however, is partly based upon a series of returns from 1857 to 1859 inclusive, which are not so reliable as those of later years, and if we examine the subsequent returns, we find that the actual mortality of this quarter is only 134 in excess of that of the seven preceding years.

TABLE I., *shewing Average Deaths in Madras during the Second Quarters of seven years ending 1866.*

	Small-pox.	Fever.	Dysentery.	Diarrhoea.	Cholera.	Other Diseases.	Total.
Second Quarter, 1860.....	90	519	305	114	115	1,551	2,694
Do. 1861.....	163	532	305	254	430	1,283	2,967
Do. 1862.....	397	525	249	222	553	1,309	3,260
Do. 1863.....	44	560	319	212	257	1,557	2,949
Do. 1864.....	59	481	244	233	52	1,353	2,422
Do. 1865.....	12	543	231	225	34	1,274	2,319
Do. 1866.....	34	553	287	225	320	1,507	2,926
Total.....	799	3,713	1,940	1,485	1,766	9,834	19,537
Average....	114.1	530.4	277.1	212.1	252.2	1404.8	2791.0

The first quarter of the present year had been unhealthy, as noted in my last report, and the second quarter was, comparatively to it, less unhealthy. The first quarter shewing 3,715 deaths (731 above the average of ten previous years), the second quarter shewing an increase of 343 in deaths.

The actual number of deaths in the period now under review is observed to be within one of that recorded in the same quarter in 1866, it exceeds that of 1860, 1864 and 1865, and is less than that of 1861, 1862 and 1863.

The death rate has been at the annual rate of 26.0 per mille of the whole population, estimated at 450,000, as against 33.02 of the preceding quarter. The mortality among Europeans and East Indians amounted to an annual rate of 28.59 per mille, if the last Census of the Municipal Commissioners be taken as the basis of calculation. But this census is now nearly five years old, and the total of all inhabitants in Madras (427,771) is now always assumed to have risen to not less than 450,000. If therefore a corresponding increase has taken place in the European and East Indian community, then the original 16,368 has risen to 17,219 and the death rate has been an annual one of 27.17 per mille, or slightly in excess of that of the general population.

Here I must bring to the notice of Government that the present census tables (those of the Municipal Commissioners) are, both from the date at which they were drawn up and from the method of their compilation, extremely unreliable. Should the Municipal Act (IX of 1867, Madras) receive the sanction of the Supreme Government, I trust that the Municipal Commissioners may be moved to take early action to bring into effect the course indicated in Section 225 of that Act. Until this is done, it is impossible to estimate correctly the *pro rata* mortality of the population of Madras. The very valuable and interesting reports of Mr. Cornish and Dr. W. A. Smith on the subject lose much of their value from the necessity of their adopting arbitrary numbers as the basis of their calculations, the former Officer taking 450,000, and the latter, in his Annual Report for 1865, 427,771, or for facility of calculation, 430,000.

The quarter under review is usually the healthiest season in Madras, but, like the same period in 1866, it has not proved generally remarkable in this respect.

It is deserving of notice that a most marked discrepancy is apparent in the general totals of deaths from various diseases of Miasmatic origin in the second quarters of these two years, while the total mortality was almost identical. Of the total deaths from Miasmatic disease in the two years, there were as follows:—

TABLE II.

DISEASE.	1866.	1867.	Increase.	Decrease.
Small-pox	34	248	214	...
Fevers	553	593	40	...
Dysentery	287	340	53	...
Diarrhoea	225	152	...	73
Cholera	320	2	...	318
Other Miasmatic diseases ...	50	35	...	15
Total Miasmatic diseases ...	1,469	1,370	...	99
Total of all other diseases ...	1,457	1,555	98	...
Grand Total...	2,926	2,925	...	1

The following will show the comparative death-rate of the first and second quarters of this year.

TABLE III.

DISEASE.	First Quarter.	Second Quarter.	Increase.	Decrease.
Small-pox	98	248	150	...
Fevers	697	593	...	104
Dysentery	484	340	...	144
Diarrhoea	277	152	...	125
Cholera	600	2	...	598
Other Miasmatic diseases ...	27	35	8	...
Total Miasmatic diseases ...	2,183	1,370	...	813
Total of all other diseases ...	1,532	1,555	23	...
Grand Total...	3,715	2,925	...	790

While, therefore, the salubrity of the second quarter is shewn as considerably higher than that of the first quarter, it cannot be overlooked that in all the more serious forms of Miasmatic diseases, except cholera, there was a marked increase in mortality as compared with the second quarter of 1866. The total deaths from all Miasmatic diseases amounted to 1,370, as against the preceding decennial average of 1283.7. Of non-miasmatic diseases, 1,555 cases proved fatal as against a similar average of 1298.9. The total deaths amounted to 2,925 as against the same previous average of 2582.6 for ten years and 2,791 for seven years; not only, however, was there an increase of total mortality among the population, but every class shewed an increased rate of mortality. To this three causes have contributed. *First*, the incorrect returns from 1857 to 1859, which do not fully exhibit the total mortality. *Second*, the prevalence of small-pox, fever, and dysentery, all contagious diseases. *Third*, the high price of provisions by which insufficient food was too often used, and those suffering from want were debilitated and rendered obnoxious to any disease.

I have reason to believe that this latter cause was especially potent in the case of the less affluent portion of the East Indian community, hence the notable increase in the number of deaths occurring among them.

The details of these items of information are shewn in the following table :—

TABLE IV, Deaths in the Second Quarter of 1867, arranged by Race and Caste.

	Europeans.		East Indians.		Hindoos.		Mahomedans.		Total.		General Total.
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	
Miasmatic Diseases.											
Small-pox	...	...	...	...	...	...	...	...	...	...	248
Fever	...	...	...	...	...	...	...	...	...	...	593
Dysentery	...	...	...	...	...	...	...	...	...	...	340
Diarrhoea	...	...	...	...	...	...	...	...	...	...	152
Cholera	...	...	...	...	...	...	...	...	...	...	35
Other Miasmatic diseases	...	...	...	...	...	...	...	...	...	...	1,370
Total Miasmatic diseases	2	1	17	18	620	567	70	75	709	661	1,555
Total of all other diseases	23	10	26	20	657	552	139	128	845	710	1,555
Total	25	11	43	38	1,277	1,119	209	203	1,554	1,371	2,925
Mean Mortality of ten Second Quarters, from 1857 to 1866.											
Miasmatic diseases	8.0	3.2	14.4	13.7	565.8	527.3	73.4	77.9	661.6	622.1	1,283.7
Other diseases	17.4	6.1	21.0	21.3	542.2	467.8	110.7	112.4	691.3	607.6	1,298.9
Total	25.4	9.3	35.4	35.0	1,108.0	995.1	184.1	190.3	1,352.9	1,229.7	2,582.6
Increase	...	...	...	...	...	...	...	...	...	...	...
Decrease	...	...	...	...	...	...	...	...	...	...	...

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The marked decrease in the number of deaths arising from fevers, dysentery, diarrhoea and cholera in the second quarter, as compared with the first quarter, are clearly referable to the increased temperature of the air, and to the absence of any introduction of cholera into Madras as noted below.

As regards the several classes of the population, it has been already observed that the East Indian community suffered severely, there were 35 deaths from miasmatic diseases against an average of 28 in ten preceding years, and 46 cases of non-miasmatic disease proved fatal, being slightly over the average. As regards miasmatic disease, it should be remembered that there was no cholera fatal in Madras among East Indians, in the period under notice, and if this cause of mortality be eliminated from the previous quarter, an increase of five fatal cases of miasmatic disease is shewn in the second quarter and an increase of 13 upon the experience of the same quarter of 1866. The chief cause of this was the occurrence of nine fatal cases of small-pox.

The deaths from miasmatic diseases among Europeans were remarkably few, only three having occurred.

Among Hindoos and Mahomedans, an amount of mortality above the average of ten previous years occurred from all causes. The former shewed a marked increase in the amount of fatal miasmatic disease. This form of disease constituted the cause of nearly half of the total mortality of the whole population.

Small-pox proved fatal in 248 cases, being more than double the average of the preceding seven years. In 1866 only 34 cases died in this quarter from this cause. A reference to the accompanying diagram will shew that this disease, which had very slowly commenced as an epidemic early in January and risen rather suddenly about the middle of March, continued to rise in fatality until the early part of April, when it slowly declined and continued doing so for two months, and at the conclusion of the quarter, it again shewed a tendency to rise. The absence of the disease among Europeans is very satisfactory,

but the large number of casualties occurring from it, indicates the urgent necessity of increased exertions to extend the operations of the Vaccination Department. Hindoos do not seem to have been affected more than Mahomedans *pro rata* of population.

The total mortality from Fevers was 593, the highest number witnessed in eight years as a comparison with the figures in the margin will shew. The septennial average for this quarter being only 530. It may be here remarked that all through the South of India fever of a low type has proved rapidly and unusually fatal in 1866 and 1867. It is observed that the fatality from this disease is much greater among males than females, except

in the case of Hindoos, where the proportion of deaths is *pro rata* of the population classified by sexes.

Fevers.	
1860	519
1861	532
1862	525
1863	560
1864	481
1865	543
1866	553
Total...	3,713
Average...	530.4

Dysentery, like Fever, has been unusually fatal, being nearly 23 percent. more than the average of seven previous years. The diagram does not show any remarkable coincidence between the course of this disease and that of Small-pox, except in the tendency of both diseases to decline during the month of May.

Notwithstanding the large number of deaths from Dysentery, it is observed that Diarrhoea has fallen much below the average of previous years. Only 152 fatal cases of Diarrhoea occurred, and as 340 of Dysentery took place, the disproportion between the cases of these cognate diseases is very remarkable. It is to be observed that the total mortality from the two causes (492) is almost identical with that of the previous seven years (489). The only explanation that suggested itself is, that as the great

Diarrhoea.	
1860	114
1861	254
1862	222
1863	212
1864	233
1865	225
1866	225
Total...	1,485
Average...	212.1

mass of the lower orders had been suffering from distress, deficient clothing, and insufficient and non-nutritious food, there was a tendency on the part of bowel complaint to at once assume, or eventually pass into, its more severe form. The minor disease shewed little intensity at any time, and although it continued steadily through the whole quarter, it shewed little variation in intensity. The weekly average number of deaths was from 6 to 18, the minimum and maximum numbers. On examining in detail the several reports of death from this disease, I find that of the 152 cases, the ages were as noted below.

No death from Diarrhoea occurred among Europeans during the quarter. Of the five deaths among East Indians, three were under two years of age, and one of an old person. A large proportion, one-third, of those among Mahomedans, were persons of advanced age, 75 to 85; one under three years, and the remainder middle aged. Among one-third of all deaths were children under five years of age, and one-fifth persons from 65 to 85 years of age.

I am unable, however, to account for the much greater prevalence of Diarrhoea among Hindoos than among Mahomedans.

TABLE V, Return shewing the Deaths from Diarrhoea during the second Quarter of 1867, according to Ages and Class.

CLASS.	AGES AT DEATH.														
	All ages.	Total under 1 Year.				Total under 5 Years.									
		1	2	3	4	5	10	15	25	35	45	55	65	75	85
Europeans.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
East Indians.....	5	2	1	0	0	0	3	0	0	0	1	0	0	0	0
Mahomedans.....	9	0	0	1	0	0	1	0	0	1	2	0	1	0	2
Hindoos.....	138	5	16	17	7	2	47	7	6	4	4	8	13	21	12
Total...	152	7	17	18	7	2	51	7	6	5	7	8	14	23	12

The experience of the quarter under review, as regards this disease cannot, I regret to say, be regarded as other than exceptional. Among the whole population only two deaths were recorded, and so far as our information goes, both were imported cases. The disease which had been prevalent in the early part of January after a slight decline, rose to 104 in the fourth week of that month (5,408 per annum) or 62.4 more than the average of weekly mortality for

seven years. The disease then steadily declined, until it had almost disappeared, and two cases occurring in the last two days of the month of March seemed to terminate the disease. It was then absent for more than three weeks, but on the 26th of April, a native merchant who had on the previous day arrived at the village of Pereamootoo, was seized with the disease and died. None of the persons residing in the same house were attacked. The other case occurred on 17th May, in a Mahomedan resident in Triplicane, who was seized with the disease at Trivatore where he had been exposed to the contagion of the disease; no persons residing in the house were attacked.

The remarkable immunity from this disease clearly disproves the assertion of the endemicity of Cholera in Madras so unhesitatingly put forward by the Cholera Congress at Constantinople. [I may here anticipate my next quarterly Report by stating that an accidental delay in the preparation of the diagram to accompany this Report enables me to add, that up to this day (September 6th) only one other case of death from Cholera has been reported. It was that of a man at 36, resident in Triplicane, and who had not been exposed to the contagion of the disease.—H. B. M.]

As the supposed endemicity of Cholera in Madras has been by many writers attributed to the existence of high heat, I have prepared the following table, which tends to disprove any supposed connection between the disease and the state of the atmospheric heat.

It will be seen that this mysterious disease assumes its most intense form at all times and seasons of the year; and, I may add, that in second quarter of last year the disease reached its weekly minimum on 5th May, it then suddenly rose, a fortnight afterwards fell slightly, and in the penultimate week reached its maximum 50.

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TABLE VI., shewing deaths from Cholera in all Madras for each month of 7 years, and for 8 months of 1867.

YEARS	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	Weekly aver- age.
1860.....	3	2	2	6	22	87	1,318	637	276	160	91	76	2,580	49.6
1861.....	38	75	54	150	204	76	183	599	786	343	107	161	2,776	53.3
1862.....	425	435	229	102	189	267	126	222	242	501	519	328	3,635	69.9
1863.....	372	452	455	154	84	19	5	8	2	46	10	77	1,384	32.3
1864.....	133	110	106	45	3	4	4	97	38	15	9	10	574	11.0
1865.....	121	72	54	20	10	4	3	302	120	118	45	45	944	18.1
1866.....	90	73	149	83	77	160	577	544	534	283	93	312	2,984	57.3
Total.....	1,191	1,269	1,049	500	539	617	2,116	2,409	1,998	1,466	874	1,009	15,177	...
Average.....	170.1	131.2	149.8	80.0	84.1	88.1	302.2	341.1	235.4	209.4	124.8	144.1	2163.1	41.6
1867.....	384	178	58	1	1	...	...	1	...	...	...	...	...	...

* Up to 6th.

From the foregoing, it appears that the months of April, May and June shew a less total of deaths in seven years than any other months in the year, while the three subsequent months shew the highest average of the whole year, while the temperature is little less than that of April, May and June. So far therefore as these returns go, they lead to the negative inference that *high heat does not promote the epidemicity of, nor does it afford immunity from, Cholera.*

I cannot, however, fail to direct the attention of Government to the singularly small number of fatal cases observed in May and June 1864 and 1865.

Up to 1864 the festival at Conjeveram had almost invariably resulted in an outbreak of Cholera either at the feast or among the travellers returning from it. Sanitary measures were adopted on the recommendation of Honorable Mr. Ellis in 1864, 65, 66 and 67, and the reports, now before me, show that in not one of these four years did Cholera appear. From Conjeveram, previously, the disease had been imported into Madras, and hence, I believe, the high death-rate shewn in April, May and June of 1861, 62 and 63.

This subject is now under special report by a Committee appointed by Government.

It is not a little remarkable that while the records of this Office prove that the year 1866 was unusually attended by Cholera in Madras and in several of the Military Stations trooped by Europeans and Natives, the second quarter of the present year should have been singularly free from this disease. I have already shewn how forcibly this applies to Madras. I am happy to add that only two cases of Cholera, both at Secunderabad, were witnessed among all the European Troops of the Presidency during this quarter. Among Native Troops, one (not fatal) occurred at Quilon in the tenth week; and one in the sixth, two in the eleventh and two in the twelfth week at Kurnool, where the disease was epidemic among the Civil population. In the corresponding quarter of 1866, the admissions among European Troops were 5, and those among Native Troops 22.

The accompanying Diagram, which shews the meteorological condition of Madras during the second quarter of this year, gives full details on the following subjects.

ATMOSPHERIC PRESSURE.—This has averaged during the quarter 29.758, being .007 above the average; being some slight variation from the corresponding period of 1866

when it was .006 below the average. A slight fall of the Barometer took place in the fourth week and from a previous general average of 29.868, a gradual fall took place until it was only read at 29.623 in the penultimate week.

TEMPERATURE.—The heat during the quarter was considerable, reaching in the ninth week to 105.4°, being only .6 lower than the corresponding week in 1866, which contained in it the hottest day on record. There was a very rapid rise in temperature after the fourth week up to the ninth; there was then a slight decline. But the average mean maximum temperature was 96.5° as against the twenty years' average; of 93.1; the season was, however, on the whole much less hot than that of 1866, when the mean maximum temperature amounted to 98.81°.

The mean minimum temperature was 80.6°, being 1.3 in excess of the twenty years' average and 1.1 below that of corresponding quarter of 1866. The mean temperature was 86.8, being 1.8 above the twenty years' average and 1.70 below 1866. The season may therefore be regarded as hotter than the average.

HUMIDITY.—The percentage of Humidity was 67, being 3 less than the average and 4 above that of 1866. The increase of humidity thus shewn, as compared with last year, was less favourable to the public health.

RAINFALL.—This amounted only to 2 inches against a previous average of 5.94. From 1st January to 30th June only 2.17 inches of rain have fallen: there should be 7.64, shewing a deficiency of 5.47.

VELOCITY AND DIRECTION OF WIND.—The wind has shewn a velocity somewhat more than the average. It has been on an average at the rate of 219, the previous average being 208. The velocity, however, this year is 17 miles daily less than in 1866. This also tends, with high heat, to render this quarter unhealthy as compared with last year.

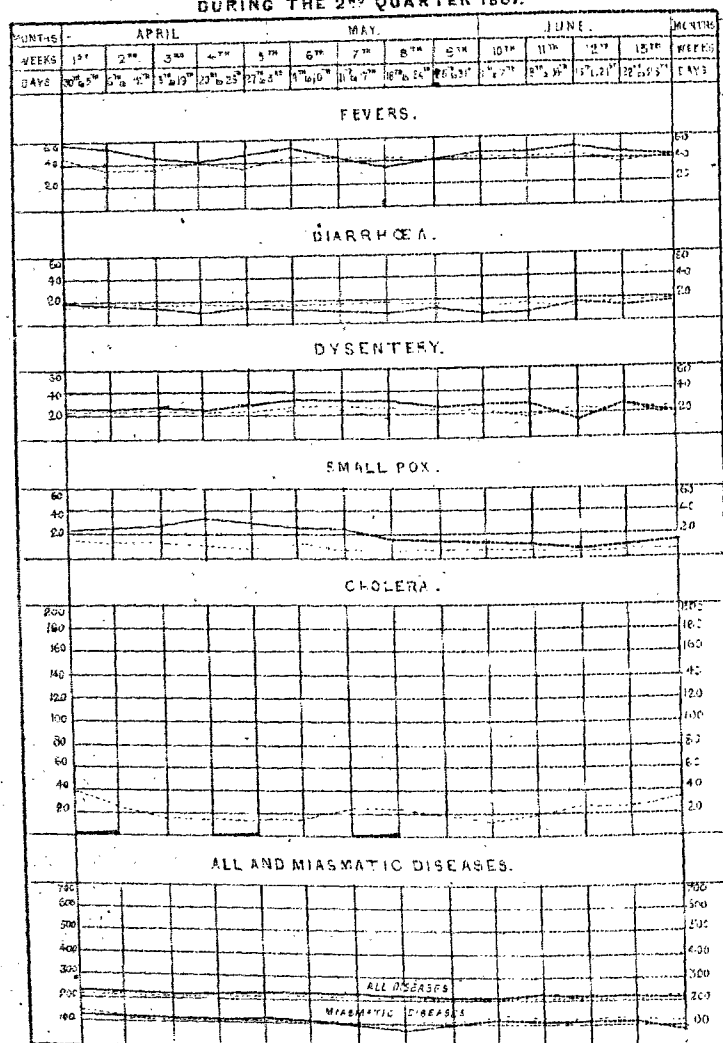
Table shewing the mortality from Miasmatic Diseases in the last 13 weeks.

	April 5.	April 12.	April 19.	April 26.	May 3.	May 10.	May 17.	May 24.	May 31.	June 7.	June 14.	June 21.	June 28.	Total.
Fevers.....	54	42	40	45	54	43	36	40	48	51	56	45	44	598
Diarrhoea.....	14	12	7	13	12	9	6	10	8	9	18	13	15	146
Dysentery.....	24	27	24	28	34	31	28	22	29	29	29	28	20	343
Small-pox.....	26	27	36	31	23	24	18	13	13	13	7	10	12	253
Cholera.....	2	2	...	1	...	...	1	...	...	...	...	...	...	4
Other Miasmatic diseases...	2	2	5	1	2	6	2	2	2	3	2	6	3	38
Total Miasmatic diseases.....	122	110	112	119	125	113	91	87	100	105	102	102	94	1,382
All diseases.....	230	222	219	237	238	233	230	214	229	237	226	224	210	2,929

Average of the corresponding weeks for 7 previous years.

Fevers.....	38.0	38.5	40.0	39.3	42.4	41.8	41.7	40.4	42.6	40.7	42.9	39.8	42.1	530.2
Diarrhoea.....	16.1	11.1	15.9	14.1	15.9	16.6	17.1	13.5	15.8	15.2	13.5	15.8	17.2	207.8
Dysentery.....	20.8	22.7	23.1	23.1	20.4	23.1	22.6	21.6	20.5	20.0	18.0	20.5	21.4	277.8
Small-pox.....	12.0	12.2	11.9	9.0	10.2	8.5	7.6	8.1	5.9	4.7	4.9	5.1	4.5	103.5
Cholera.....	22.2	19.3	17.6	17.4	18.5	20.7	20.1	15.8	13.6	19.3	21.9	24.8	34.2	265.4
Other Miasmatic Dis- eases.....	4.8	2.9	3.3	4.9	2.9	4.0	3.2	3.2	3.1	3.9	3.1	3.9	2.9	46.5
Total Miasmatic Dis- eases.....	114.8	109.7	112.3	107.8	110.3	114.7	112.3	102.6	101.5	103.8	104.3	109.9	122.2	1,426.2
All Diseases.....	216.5	213.1	220.0	211.5	214.5	226.2	218.5	210.6	209.2	213.2	205.1	192.2	229.3	2,801.2

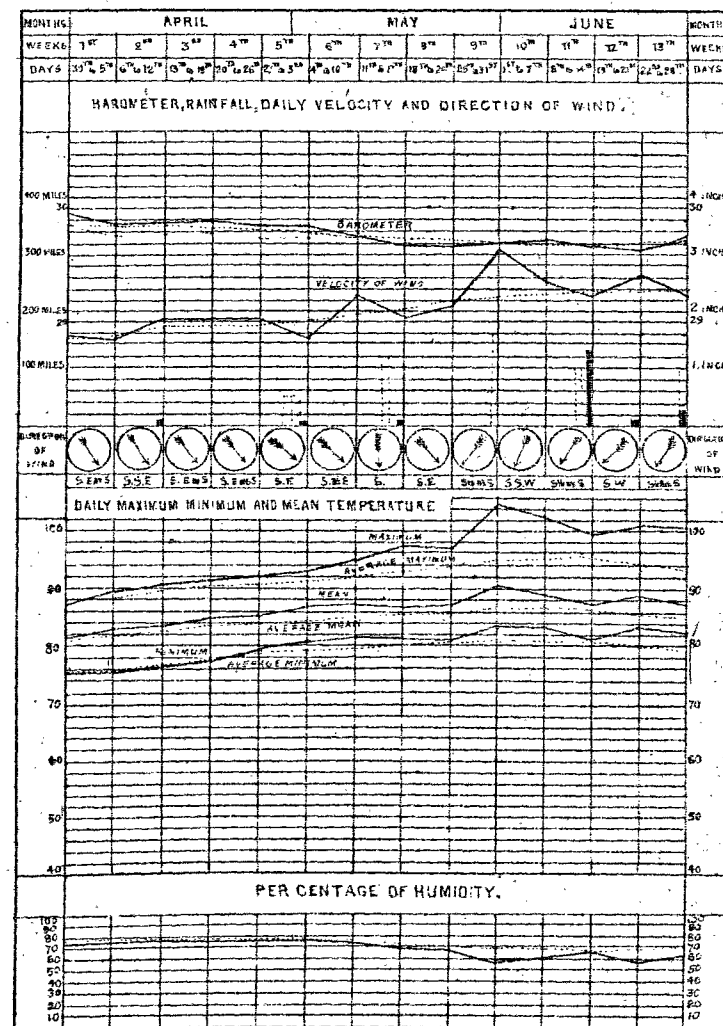
DIAGRAM SHOWING THE MORTALITY FROM MIASMATIC DISEASES IN MADRAS. DURING THE 2ND QUARTER 1867.



N.B. The total Mortality from each disease during each week is plotted on the perpendicular lines which represent these periods. The horizontal dotted wave lines show the average mortality from each disease for the previous five years.

DEPT. OF MED. LITH. MADRAS.

DIAGRAM SHOWING THE METEOROLOGICAL CONDITION OF MADRAS. DURING THE 2ND QUARTER 1867.



N.B. The mean weekly Meteorological elements are placed on the perpendicular lines. The dotted wave lines show the bimonthly average for twenty years from observations kept at the Madras Observatory.

DUMNEY & SONS LITH. MADRAS.

Mean Meteorological Observations, for the past 13 weeks.

	29-861	29-866	29-871	29-842	29-837	29-768	29-697	29-678	29-691	29-711	29-661	29-623	29-757	Average
Barometer reduced to 32° F	...	89.5	90.7	91.7	92.2	93.3	95.0	97.6	98.6	105.4	102.2	100.6	100.2	96.5
Mean Maximum Temperature	...	75.7	76.6	77.7	79.7	80.7	81.5	81.2	83.9	83.6	81.2	83.2	82.3	80.6
Do. Minimum do.	...	82.4	83.4	84.4	85.6	86.1	87.6	86.7	90.8	89.6	87.0	89.0	87.2	86.8
Do. Temperature	...	72	73	73	74	74	71	69	59	60	65	58	62	67
Do. Humidity	...	S. E.	S. S. E.	S. E.	S. E.	S. E.	S. by E.	S.	S. W.	S. S.	S. W.	S. W.	S. W.	S.
Prevailing Wind	...	by S.	by S.	by S.	by S.	by S.	by E.	S. E.	by S.	W.	by S.	by S.	by S.	by S.
Mean velocity in Miles	...	152	183	184	185	143	226	194	305	278	252	231	249	219
Rain-fall	...	0.10	...	...	...	0.01	...	0.07	...	0.01	13.6	0.11	0.34	2.00

Table shewing the Mean Half-Monthly Meteorological condition of Madras for the past 20 years 1841-1861.

	Half month ending 15th April.	Half month ending 30th April.	Half month ending 15th May.	Half month ending 31st May.	Half month ending 15th June.	Half month ending 30th June.	Average.
Barometer reduced to 32° F	29-843	29-806	29-756	29-707	29-692	29-704	29-751
Mean Maximum Temperature	90.0	91.0	93.9	95.1	95.8	98.7	93.1
Do. Minimum do.	77.4	78.4	79.8	80.4	80.7	79.4	79.3
Do. Temperature	83.1	84.0	85.3	86.2	86.6	85.0	85.0
Do. Humidity	76	75	75	68	64	67	70
Prevailing Wind	S. by E.	S. by E.	S.	S. S. W.	S. W.	S. W.	S. by W.
Mean velocity in Miles	173	173	209	225	236	240	268
Rain-fall	0.16	0.65	1.32	1.60	0.92	1.29	5.94

TABLE II.—*Shewing the number of Deaths from Miasmatic Diseases in the Third Quarter.*

DISEASE.	1866.	1867.	Increase.	Decrease.
Small-pox	29	158	129	..
Fevers	500	605	105	..
Dysentery	285	280	..	5
Diarrhoea	172	227	55	..
Cholera	1,655	1	..	1,654
Other Miasmatic diseases	26	34	8	..
Total Miasmatic diseases ...	2,667	1,305	..	1,362
Total of all other diseases	1,501	1,468	..	33
Grand Total...	4,168	2,773	..	1,395

It will be seen from the foregoing table that in almost every instance, excepting cholera, there has been a marked increase in the amount of miasmatic disease.

TABLE III.—*The following will show the comparative death-rate of the 1st, 2nd and 3rd Quarters from all diseases.*

DISEASE.	First Quarter.	Second Quarter.	Third Quarter.	Increase in 3rd Quarter compared with		Decrease in 3rd Quarter compared with	
				1st Quarter.	2nd Quarter.	1st Quarter.	2nd Quarter.
Small-pox ...	98	248	158	60	..	..	90
Fevers ...	697	593	605	..	12	92	..
Dysentery ...	484	340	280	..	..	204	60
Diarrhoea ...	277	152	227	..	75	50	..
Cholera ...	600	2	1	..	..	599	1
Other Miasmatic diseases	27	35	34	7	..	..	1
Total Miasmatic diseases	2,183	1,370	1,305	..	..	878	65
Total of all other diseases	1,532	1,555	1,468	..	..	64	87
Grand Total...	3,715	2,925	2,773	..	..	942	152

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I have, in the report for the second quarter of this year, detailed the reasons which tended to act injuriously against the health of the general population of Madras during the present year. It is satisfactory to observe that, as shown in the following table, there has been a decrease of mortality eminently conspicuous among Europeans, while among East Indians the decrease has been very slight; among Hindoos and Mahomedans it has been satisfactory.

TABLE IV.—Deaths in the Third Quarter of 1867 arranged by Race and Caste.

DISEASE.	Europeans.		East Indians.		Hindoo.		Mahomedans.		Total.		General Total.
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	
Miasmatic Diseases.											
Small-pox	...	...	0	2	77	43	12	15	98	60	158
Fevers	4	1	6	8	287	252	18	29	315	290	605
Dysentery	2	...	2	4	126	123	10	13	140	140	280
Diarrhoea	...	...	4	5	100	109	...	6	107	120	227
Cholera	...	...	...	...	...	...	...	...	...	1	1
Other Miasmatic diseases	...	...	1	3	12	14	1	3	14	20	34
Total Miasmatic	6	1	22	22	602	542	44	66	674	631	1,305
Total of all other diseases	16	2	22	23	672	502	57	129	807	661	1,468
Total...	22	3	44	50	1,274	1,044	141	195	1,431	1,292	2,723
Mean Mortality of ten Third Quarters, from 1857 to 1866.											
Miasmatic diseases	15.6	7.4	18.7	23.4	752.4	707.9	121.8	120.1	908.5	853.8	1767.3
Other diseases	16.6	7.6	26.5	27.3	564.3	511.8	124.4	110.3	731.8	657.0	1388.8
Total...	32.2	15.0	45.2	50.7	1316.7	1219.7	246.2	230.4	1640.3	1510.8	3156.1
Increase	...	...	...	...	...	...	...	...	...	...	...
Decrease	...	...	...	...	...	...	...	...	...	...	...

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Small-pox proved fatal in 158 cases, being nearly three times the average of previous years.

Small-pox.	
1860	54
1861	162
1862	75
1863	16
1864	3
1865	14
1866	29
Total...	353
Average...	50.4

It is much to be regretted that this disease was widely prevalent and extensively fatal during the second and third quarters of the present year; and it will be seen from the accompanying diagram, that a persistent weekly mortality, averaging about 13, was maintained throughout the quarter. While the absence of this disease among Europeans cannot fail to be satisfactory, it is to be regretted that among the East Indian population, so large a number of casualties should have occurred. I may here observe that the occurrence of this and all other contagious disease when proving fatal, is immediately brought to the notice of the Deputy Inspector General Indian Medical Department, of the Surgeon of the District in which the casualty has occurred, of the Port and Marine Surgeon and of the Municipal Commissioners.

The total mortality from Fevers amounted to 605 cases; this number is 56 in excess of the average of the previous seven years, and was only exceeded in one instance (1862) in these antecedent third quarters. The mortality among the opposite sexes was about equal <i>pro rata</i> of population. But among East Indians and Mahomedans, the higher mortality was observed among females. It will be observed that the fever line throughout the quarter varied considerably from the average of previous years, while the disease showed a tendency to rise at the end of September. The present year has been essentially a fever year throughout the whole of Southern India, and the actual number of cases proving fatal in the third quarter was only 12 in excess of those registered in the second quarter, while it fell short of those in the first quarter by 92. The largest number of casualties observed in any one week was 55 in that ending 27th September.	
Fevers.	
1860	592
1861	544
1862	625
1863	521
1864	498
1865	579
1866	500
Total...	3,859
Average...	551.2

Two hundred and eighty cases of this disease proved fatal, being somewhat below the average of seven previous years. The numbers in the third quarters of 1865-

Dysentery.		
1860	381	
1861	369	
1862	338	
1863	283	
1864	257	
1865	281	
1866	235	

Total...2,194

Average...313.4

66-67 are almost identical. Throughout the quarter Dysentery continued almost uniformly below the line of previous experience, and the disease did not show any considerable amount of variation, as to its degree of intensity during the weeks embraced in the quarter under review.

Among Europeans two males died in middle age. The most remarkable feature about this disease, is the large number of Hindoos who died at advanced ages; nearly one-half of the whole fatal cases in that caste having occurred in persons upwards of 55 years of age.

TABLE V.—*Shewing the Deaths from Dysentery during the Third Quarter of 1867, according to Ages and Class.*

CLASS.	AGES AT DEATH.																
	All ages.	Total under 1 year.															
		1	2	3	4	Total under 5 years.											95 and upwards.
Europeans	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
East Indians	6	1	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..
Mahomedans	23	..	..	2	1	1	4	1	2	1	..	2	..	1	3	4	1
Hindoos	249	1	..	11	5	2	19	4	6	4	8	30	42	48	38	44	6
Total...	280	2	..	14	6	3	25	5	9	5	8	33	43	50	42	48	11

Two hundred and twenty-seven cases of Diarrhoea occurred, being somewhat less than the average of seven previous years. I

Diarrhoea.		
1860	242	
1861	309	
1862	290	
1863	201	
1864	227	
1865	305	
1866	172	
Total...	1,746	
Average...	249.4	

have, in the Report of the second quarter of this year, alluded to causes which appeared to me likely, while increasing the number of cases of Dysentery, to diminish the amount of Diarrhoea witnessed. These causes, I think, have ceased to operate dur-

ing the present quarter, and it is apparent from the returns, that a very large number of cases proving fatal were those of young children, who are at all times so susceptible to the fatal effect of this, which is essentially one of the diseases of children. No Europeans died from this disease. The number of East Indians was nearly double that reported in the second quarter; while 209 Hindoos died, only 138 died of Diarrhoea in the previous quarter.

TABLE VI.—*Shewing the Deaths from Diarrhoea during the third Quarter of 1867, according to Ages and Class.*

CLASS.	AGES AT DEATH.																
	All ages.	Total under 1 Year.															
		1	2	3	4	Total under 5 Years.											95 and upwards.
Europeans	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
East Indians	9	3	1	1	1	6	..	..	..	..	..	..	1	1	..	..	..
Mahomedans	9	3	..	3	1	7	1	..	..	..	..	..	..	..	..	1	..
Hindoos	209	3	35	18	20	7	83	4	14	6	13	16	10	14	22	24	3
Total...	227	9	36	22	21	8	96	5	14	6	14	17	10	14	24	24	3

Only a single case of this disease occurred during the

Cholera.		
1860	2,131	
1861	1,568	
1862	590	
1863	15	
1864	139	
1865	455	
1866	1,655	
Total...	6,553	
Average...	936.1	

quarter; the case was a sporadic one, occurring in a Hindu female. It will be observed that in previous years the prevalence of this disease during the third quarter was very well marked. I am utterly at a loss to assign any reason why, during the past six months, Madras should have enjoyed such an almost perfect immunity from this disease.

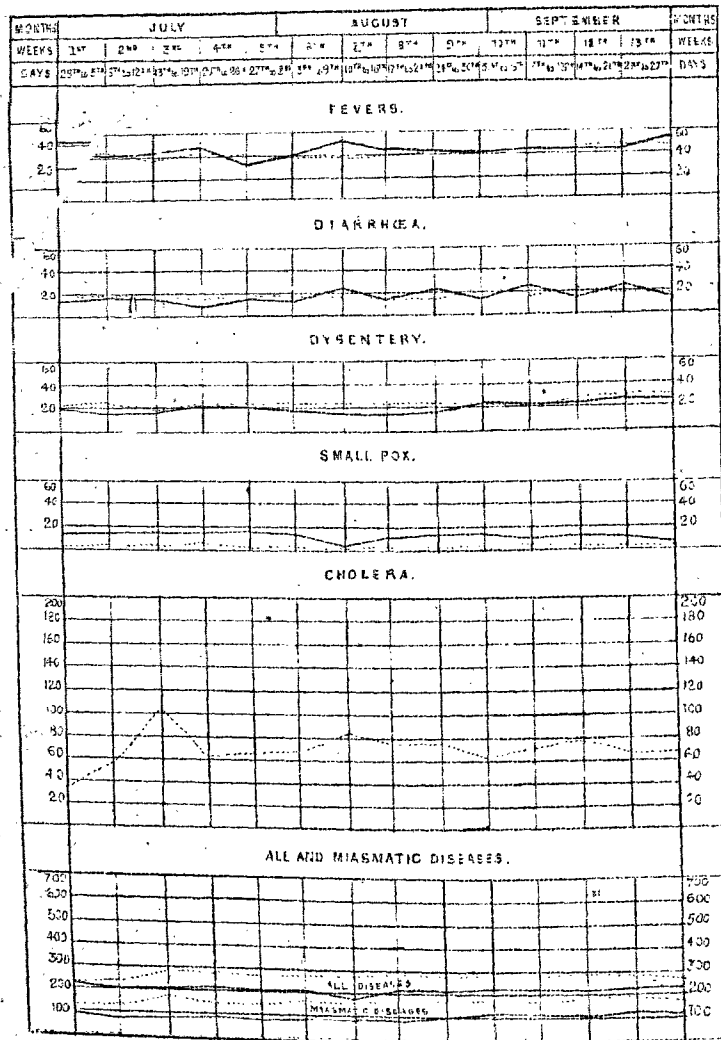
TABLE VII.—Showing the Mortality from Miasmatic Diseases in the last 13 weeks.

	July 5.	July 12.	July 19.	July 26.	Aug. 2.	Aug. 9.	Aug. 16.	Aug. 23.	Aug. 30.	Sept. 6.	Sept. 13.	Sept. 20.	Sept. 27.	* Total.
Fever,.....	41	46	54	36	41	54	47	45	43	45	45	45	55	597
Diarrhoea,.....	15	15	16	16	14	23	18	21	17	24	15	23	13	227
Dysentery,.....	18	17	22	20	18	15	14	18	23	22	26	27	26	271
Small-pox,.....	13	12	13	17	16	5	12	13	15	12	15	12	6	161
Cholera,.....	...	...	...	...	...	...	...	...	1	...	...	...	...	1
Other Miasmatic Diseases,.....	2	1	...	2	5	2	3	4	5	3	1	2	2	32
Total Miasmatic Diseases,.....	89	91	98	91	94	99	94	101	103	106	102	111	104	1,239
All Diseases,.....	200	203	216	204	210	197	210	209	223	209	211	229	211	2,742

Average of the corresponding weeks for 7 previous years.

Fever,.....	43.0	39.2	42.3	40.9	39.8	37.9	39.8	42.4	42.5	44.5	46.1	48.2	46.3	552.9
Diarrhoea,.....	15.0	15.7	16.3	16.9	15.9	15.4	16.5	15.3	21.3	17.7	20.2	19.7	19.8	225.7
Dysentery,.....	23.1	19.4	22.3	22.5	24.5	23.0	23.4	22.7	21.4	21.9	27.4	29.6	27.9	309.1
Small-pox,.....	3.5	3.2	4.1	3.1	4.2	4.2	4.0	2.7	2.9	5.2	3.8	3.9	4.0	48.8
Cholera,.....	57.6	105.9	64.7	65.3	70.9	81.4	76.5	74.6	62.6	65.5	77.8	66.2	65.7	934.7
Other Miasmatic Diseases,.....	4.6	2.7	3.5	4.1	4.8	3.9	2.9	3.7	2.5	3.2	2.7	2.2	1.8	42.6
Total Miasmatic Diseases,.....	146.8	186.1	153.2	152.8	160.1	165.8	163.1	161.4	153.2	158.0	178.0	169.8	165.5	2113.8
All Diseases,.....	248.0	294.8	266.0	256.8	274.8	274.6	270.5	275.3	271.1	272.6	295.0	287.0	277.9	3564.4

DIAGRAM SHOWING THE MORTALITY FROM Miasmatic Diseases
IN MADRAS
DURING THE 3rd QUARTER 1867.

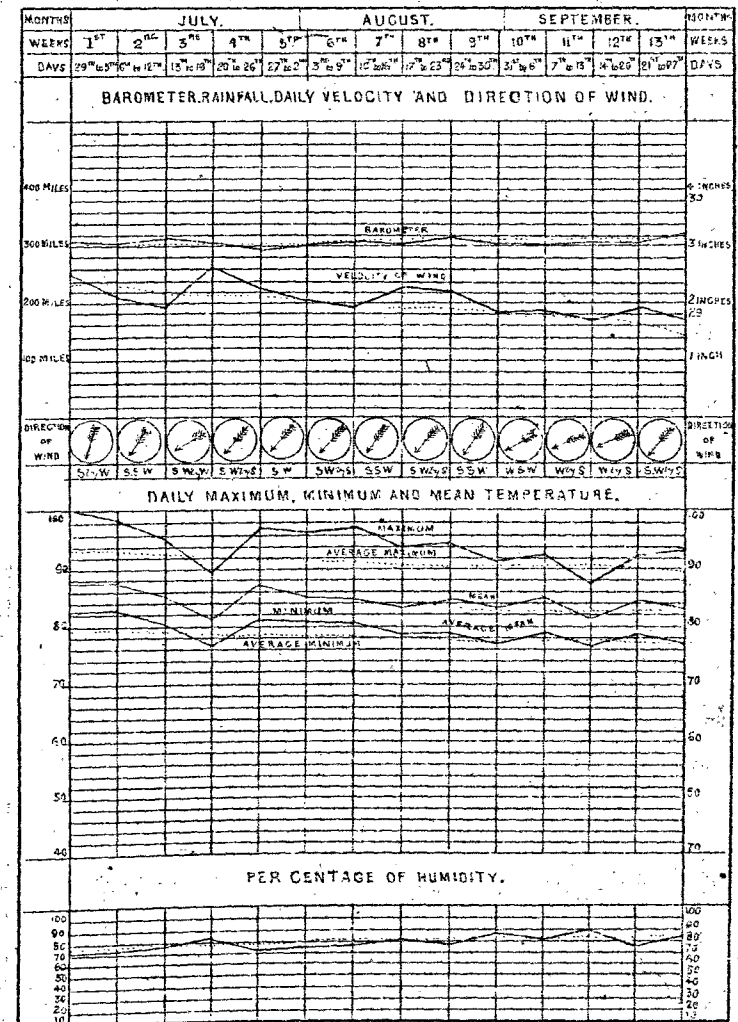


N.B. The total Mortality from each disease during each week is plotted on the perpendicular lines which represent these periods. The horizontal dotted wave lines show the average mortality from each disease for the previous seven years.

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DIAGRAM SHOWING THE METEOROLOGICAL CONDITION
OF MADRAS
DURING THE 3rd QUARTER 1867.



N.B. The mean weekly Meteorological elements are plotted on the perpendicular lines. The dotted wave lines show the bimonthly average for twenty years from observations kept at the Madras Observatory.

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Mean Meteorological Observations for the past 13 weeks.

	29-710	29-788	29-717	29-684	29-701	29-737	29-714	29-782	29-730	29-705	29-717	29-732	29-629	Average.
Barometer reduced to 32° F.....	29-710	29-788	29-717	29-684	29-701	29-737	29-714	29-782	29-730	29-705	29-717	29-732	29-629	29-735
Mean Maximum Temperature.....	93-6	95-8	89-7	97-3	96-5	97-3	94-0	94-8	91-9	93-0	87-7	92-1	93-6	94-02
Do. Minimum do.....	82-6	80-3	76-2	81-1	80-3	80-4	78-3	78-6	76-9	78-5	76-6	78-6	77-3	78-9
Do. Temperature.....	87-3	85-8	81-3	86-6	85-4	84-3	83-3	84-7	83-3	84-2	81-2	84-2	83-7	84-3
Do. Humidity.....	64	67	73	63	66	63	72	69	79	73	81	65	72	70
Prevailing Wind.....	S. by W.	S.S.W.	S. W.	S. W.	S. W.	S. W.	S.S.W.	S. W.	S.S.W.	W.S.	W. by S.	W. by S.	W. by S.	S. W.
Mean velocity in Miles.....	216	193	261	232	206	198	230	221	181	185	175	213	171	207
Rain-fall.....	0-07	...	1-69	0-17	0-11	0-07	1-65	2-24	2-37	0-47	1-45	0-05	0-57	10-91

Table shewing the Mean Half-Monthly Meteorological condition of Madras, for the past 20 years 1841-1861.

	Half month ending 15th July.	Half month ending 31st July.	Half month ending 15th August.	Half month ending 31st August.	Half month ending 15th September.	Half month ending 30th September.	Average.
Barometer reduced to 32° F.....	29-703	29-721	29-749	29-753	29-763	29-756	29-748
Mean Maximum Temperature.....	92-6	91-9	91-6	90-3	90-5	89-1	91-0
Do. Minimum do.....	78-3	78-4	78-1	77-7	77-8	77-1	77-9
Do. Temperature.....	84-3	83-9	83-5	82-3	82-9	82-2	83-2
Do. Humidity.....	69	69	71	73	72	76	72
Prevailing Wind.....	S. W.	S. W. by W.	S. W. by S.	S. W.	S. W. by S.	S. S. W.	S. by W. S.
Mean velocity in Miles.....	214	212	183	180	170	146	185
Rain-fall.....	1-98	1-98	2-08	1-78	2-08	2-20	12-05

The meteorological condition of Madras is fully shewn on the accompanying diagram. The following detailed points are of interest.

This is averaged during the quarter at 29.735, being .013 less than the average of 20 previous years. Considerable irregularity occurred in the first ten weeks of the quarter, the mercury rising and falling alternately in tolerably uniform periods of a fortnight. The Barometer was steady during the 11th and 12th weeks, but in the 13th, the concluding week of the quarter, it rose rapidly to 29.829, being the highest point which it reached during the quarter, and nearly .100 in excess of the average of the antecedent weeks of the quarter.

The heat during the quarter was high, the mean maximum being 3.02 in excess of the average of 20 preceding years, while the minimum showed an excess of

one degree over the temperature recorded in previous years. The meteorological chart shows that very considerable variations occurred between the heat witnessed in consecutive weeks. In the first three weeks the temperature fell nearly 9 degrees, while in the fourth week it rose rapidly to 97.3, an increase of 7.6 over the third week. A general downward tendency was observed from the seventh to the tenth week. In the eleventh week the lowest maximum of the quarter was recorded, viz., 87.7; but the Thermometer rose equally rapidly in the following week to the standard it had maintained from the 7th to the 10th week.

Percentage of humidity was 70, being two less than the preceding 20 years' average. The

highest degree of humidity was reached in the 11th week, but this does not seem to have acted detrimentally upon the public health except in the case of persons suffering from diarrhoea, among whom the largest mortality was observed in the 12th week.

The prevailing wind blew from the S. W. quarter, its velocity being very considerable (207) miles against an average of 185 during the preceding 20 years.

It is doubtless to this cause we must attribute the fact of the month of September, usually sultry in the extreme,

being much less so in the present year; indeed, throughout the whole quarter the high velocity of the wind tended to remove the sensation of a close and heavy atmosphere usually experienced in this quarter.

No. 21.

(III.)

FOURTH QUARTER.

THE health of Madras during this quarter has been remarkably good as regards total mortality compared with the experience of previous years: and notwithstanding the very exceptionally favorable character of the public health during the third quarter of this year, the deaths in the fourth quarter only exceed those in the third by a total of 59.

From the following table it will appear that during the last previous seven years the average total mortality of the fourth quarter has been 3,230, while the actual mortality of the quarter under review has only amounted to 2,832, showing a fall below the average of 398 deaths.

TABLE I.—Average Deaths in Madras during the Fourth Quarters of seven previous years ending 1866.

	Small-pox.	Fever.	Dysentery.	Diarrhoea.	Cholera.	Other Diseases.	Total.
Fourth Quarter, 1860....	43	689	409	409	327	1,479	3,356
Do. 1861....	126	585	361	253	614	1,364	3,303
Do. 1862....	17	569	305	283	1,341	1,486	4,006
Do. 1863....	19	512	300	236	133	1,429	2,629
Do. 1864....	3	493	252	217	34	1,413	2,412
Do. 1865....	12	624	375	286	208	1,572	3,077
Do. 1866....	12	662	409	283	688	1,773	3,827
Total....	232	4,134	2,411	1,972	3,345	10,516	22,610
Average....	33.1	590.5	344.4	281.7	477.8	1502.2	3230.0

As has been remarked with reference to the second and

third quarters, the chief influencing cause which has produced so remarkable a reduction in the total mortality has been the absence of cholera in epidemic form. In the fourth quarter of 1866, 688 cases of this disease proved fatal; if therefore this number had occurred during the quarter under review, the mortality would have been *above* the average; as, however, cholera was unusually rife in the months of October and December 1866, it is perhaps a fairer mode of calculation to consider what the average number of deaths during the thirteen weeks of this quarter has been during previous years. This is found to have been 447.6. This number, being in excess of the apparent reduction in total mortality during the quarter under review, shows that actually the mortality in it was about 39 beyond the average, if cholera be eliminated from all the returns.

The total mortality from all causes, and among all classes of people, amounted to an annual millenary rate of 25.1, assuming the population to be 450,000.

Among Europeans and East Indians, estimated at 17,219, the total deaths amounted to 125 as against the previous decennial average of 113.5. This increase, however, is not uniform in the different classes named, for while Europeans showed an actual numerical decrease of 4.1 persons, the East Indian population showed a similar increase of 15.6: the deaths of the two classes amounted to an annual rate of 29.6 per mille. This rate of mortality cannot be regarded as other than unsatisfactory, the more so as 7 deaths occurred from small-pox which ought to be regarded as a preventible disease. The occurrence of so many fatal cases of small-pox during the present year among the European and East Indian community, I shall bring prominently to the notice of the Superintendent General of Vaccination and the Deputy Superintendent of the Madras Circle.

A considerable amount of fluctuation continues, as in previous quarters of 1867, to be observed between the amount of miasmatic disease in this quarter and that observed in the corresponding period of the previous year. Small-pox and other miasmatic diseases (not identified in these Returns) show a considerable increase as compared with 1866, while all other miasmatic diseases show an equally great or even greater decrease, especially in the case of Cholera.

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TABLE II.—*Shewing the number of Deaths from Miasmatic Diseases in the Fourth Quarter of 1867.*

DISEASE. ...	1866.	1867.	Increase.	Decrease.
Small-pox	12	119	107	...
Fevers	662	561	...	101
Dysentery	409	315	...	94
Diarrhœa	283	188	...	95
Cholera	688	11	...	177
Other Miasmatic diseases ...	25	71	46	...
Total Miasmatic diseases ...	2,079	1,265	...	814
Total of all other diseases...	1,748	1,567	...	181
Grand Total...	3,827	2,832	...	995

As it is now possible to analyse the returns of the concluding and of the three antecedent quarters of the year, we are enabled to compute with facility the prevalence of each form of miasmatic disease in the several quarters comparatively to one another. As regards small-pox, the fourth quarter stands second in point of salubrity; it exhibits a greater freedom than any other quarter from mortality from fevers, and it stands second as regards dysentery from which the mortality was much less than in the first quarter. With reference to diarrhœa, it stands midway between the second and third quarters in point of salubrity; but it is considerably in advance of the first quarter of the year. The returns of mortality from cholera throughout the whole year have been so purely exceptional, that it is as unnecessary as it is useless to base any conclusions upon them. But although the fourth quarter in the present year shows a considerably higher mortality than the two

	October.	November.	December.	Total.
1860...	160	91	76	327
1861...	343	107	161	611
1862...	501	519	323	1,343
1863...	46	10	77	133
1864...	15	9	10	34
1865...	118	45	45	208
1866...	283	93	312	688
Grand Total.	1,466	874	1,009	3,349
Average...	478.4			

quarters immediately preceding it, it is worthy of notice that the total mortality from this disease is vastly below that witnessed in any of the concluding quarters during the last seven years, showing as it does only a total mortality of eleven as against a septennial average of 478.4.

While, however, as regards the miasmatic diseases named above this quarter may be said to have been generally a healthy one, it is to be observed that in other miasmatic diseases of less importance the quarter has not been salubrious as compared with the previous quarters of the year; indeed in this respect the returns are not satisfactory. This increased mortality may however in great part be referable chiefly to the lowering of temperature generally throughout the quarter as compared with the previous portion of the year and to the occasional occurrence of heavy rain (vide remarks upon the Meteorological Returns.)

Similarly, the concluding quarter of the year has shown generally an amount of mortality from non-miasmatic disease which exceeds, in different degrees, that experienced in previous quarters of the year.

The details commented upon above are shown in the following table:—

TABLE III.—*Shewing the comparative death-rate of the 1st, 2nd, 3rd, and 4th Quarters from all diseases.*

DISEASE.	First Quarter.	Second Quarter.	Third Quarter.	Fourth Quarter.	Increase in 4th Quarter compared with			Decrease in 4th Quarter compared with		
					1st Quarter.	2nd Quarter.	3rd Quarter.	1st Quarter.	2nd Quarter.	3rd Quarter.
Small-pox ...	98	248	158	119	21	...	...	...	129	39
Fevers ...	697	593	605	561	...	...	...	136	32	44
Dysentery ...	484	340	280	315	...	...	35	169	25	...
Diarrhœa ...	277	152	227	188	...	36	...	89	...	39
Cholera ...	600	2	1	11	...	9	10	589	...	...
Other Miasmatic diseases ...	27	35	34	71	44	36	37	...	...	...
Total Miasmatic diseases ...	2,183	1,370	1,305	1,265	...	...	...	918	105	40
Total of all other diseases ...	1,532	1,555	1,463	1,567	35	12	99	...	...	...
Grand Total...	3,715	2,925	2,773	2,832	...	...	59	833	93	...

The mortality among Europeans has been numerically 4.1 less than that observed during the preceding 10 years; it is almost identical with the number observed in the second quarter, but 10 more than that observed in the third; but it was 19 less than that in the corresponding quarter in the previous year. The increase is apparent chiefly in miasmatic diseases, from which 12 casualties arose as against 3 and 7 in two preceding quarters. Small-pox proved fatal in 2 cases, there having been none previously during the year. Fevers continue to contribute a large proportion of the mortality of Europeans, and dysentery and diarrhœa proved fatal in 4 cases.

Among East Indians the mortality which was 98 in the first quarter, 81 in the second and 94 in the third, amounted to 90, a numerical increase of 15.6 upon the experience of the previous decennial period in this quarter.

Among miasmatic diseases fevers and small-pox are the chief causes of mortality, while dysentery and diarrhœa contribute a large quota of the total deaths. No case of cholera occurred among either Europeans or East Indians.

The mortality among Hindoos was less during this quarter than during any previous quarter of the year, being 57.4 less than in the first quarter, 58 less than in the second and 80 less than in the third; it was numerically 57.5 below the previous decennial average of the fourth quarters.

Among Mahomedans the death-rate of the four quarters has been very variable in amount, the total mortality being 666, 413, 336 and 369. This latter, however, is numerically less than the previous ten years' average by 36.1.

TABLE IV.—Deaths in Madras during the Fourth Quarter of 1867, arranged by Race and Caste.

DISEASES.	Europeans.		East Indians.		Hindoos.		Mahomedans.		Total.		General Total.
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	
Miasmatic Diseases.											
Small-pox	1	1	2	3	26	54	23	9	52	67	119
Fevers	4	1	5	2	253	245	26	25	288	273	561
Dysentery	1	1	2	3	148	132	19	9	170	145	315
Diarrhoea	1	1	2	3	74	96	6	5	83	105	188
Cholera	...	...	...	...	6	3	2	...	8	3	11
Other Miasmatic diseases	1	...	...	3	28	22	5	12	34	37	71
Total Miasmatic diseases	8	4	11	14	535	552	81	60	635	630	1,265
Total of all other diseases	16	7	27	38	710	541	115	115	868	699	1,567
General Total...	24	11	38	52	1,245	1,093	196	173	1,563	1,329	2,832
Mean Mortality of ten Fourth Quarters, from 1857 to 1866.	35.		80.		2,338.		309.		2,832.		
Miasmatic diseases	11.1	3.6	16.8	16.0	667.7	627.1	89.5	100.3	785.1	747.0	1532.1
Other diseases	18.9	7.5	22.3	19.3	611.2	489.5	108.2	107.1	738.6	623.4	1382.0
General Total...	28.0	11.1	39.1	35.3	1278.9	1116.6	197.7	207.4	1543.7	1370.4	2914.1
	39.1		74.4		2395.5.		405.1.		2914.1.		
Increase	...	...	...	15.6	...	...	...	...	...	...	...
Decrease	...	4.1	...	...	...	57.5	...	...	...	...	82.1

Small-pox proved fatal in 119 cases, being more than 3½

Small-pox.	
1860	43
1861	126
1862	17
1863	19
1864	3
1865	12
1866	12

Total..... 232

Average..... 33.1

times the average of previous years. This disease, which has been almost constantly in Madras throughout the whole year, showed in successive quarters a total mortality of 98, 248, 158, and 119. In the fourth quarter only it proved fatal to Europeans (2), but among the East Indian population the mortality throughout the whole year was considerable. With reference to this and all other contagious diseases, I have been able, since submitting my last quarterly report, to extend the arrangements therein alluded to for bringing under the notice of the Medical and Marine authorities the casualties arising from, and the existence of, contagious diseases. The Inspector General of the Indian Medical Department has issued instructions that all Medical officers at the Presidency should submit a daily return showing the number of cases admitted under their care laboring under contagious diseases. These returns, addressed to the Deputy Inspector General Indian Medical Department, at the Presidency, are by that officer transferred to this office, where they are tabulated in a single return, copies of which are forwarded in the afternoon to the Deputy Inspector General Indian Medical Department, to the Surgeons of the several districts in which contagious diseases may have occurred, to the Port and Marine Surgeon and to the Municipal Commissioners for their information.

The accompanying chart shows that throughout the whole quarter the line of small-pox disease was constantly above that of previous experience, with the exception of the single instance of the tenth week, when the disease declined slightly below the previous average.

The total mortality from Fevers was 561, being slightly

Fevers.	
1860	689
1861	535
1862	569
1863	512
1864	493
1865	624
1866	662

Total..... 4,134

Average..... 590.5

below the average of previous years, among which it would hold about the middle place. The number of fatal cases of fevers during the present year has been very considerable, amounting to 697, 593, and 605. Of these three sets of figures, all were in excess of

the average of the corresponding quarters of the previous seven years; the quarter under review therefore is the first in which the mortality from this disease has fallen below the average of previous years and the actual mortality is below that of the three previous quarters of the present year.

Considerable variation in intensity of this disease is apparent in the weekly records indicated in the accompanying diagram and return. The maximum number in any week was 57, which fell in the succeeding week to 32, this was followed by a gradual rise in the two following weeks to 42, and after slight fluctuations an average of about 40 was experienced during the middle portion of the quarter. The mortality in the last four weeks was almost identical in each, averaging 47.5, these weeks presenting a considerably higher total mortality than any four consecutive weeks during the quarter.

315 cases of this disease proved fatal, being numerically about 30 below the average of seven preceding years. All races were unfavourably affected by it, but the mortality among Europeans (2) was less than that of the first quarter by 3, less than that of the second by 1, and less than that of the third by 3. In the fourth quarter of 1866, six cases among Europeans proved fatal. As

far, therefore, as regards this serious disease, the experience of this quarter must be considered satisfactory. The wave line of this disease throughout the quarter was almost uniformly below that of the previous seven years; it showed very little variation in point of intensity, and when changes did occur they were very gradual and of little importance.

The total number of fatal cases of this disease was 188, being nearly 100 less than the

Dysentery.			
1860	...	...	409
1861	...	...	361
1862	...	...	305
1863	...	...	300
1864	...	...	252
1865	...	...	375
1866	...	...	409
Total.....			2,411
Average.....			344.4

experience of previous seven years. The mortality from this disease during the three previous quarters had amounted to 277, 152, and 227. It is apparent therefore that the mortality during the last quarter much more nearly approached that usually experienced in the second or hot weather quarter

of the year. The only explanation which suggests itself as tending to account for the decline in Diarrhoea and Dysentery during the past quarter is the fact that the rainfall was very much less than that of previous years, while the temperature never, at its mean minimum, fell more than .5 below the average, the mean temperature being .4 above it, and the mean maximum temperature being 1.9 above the average. There was nothing in the ages of the persons dying from Dysentery and Diarrhoea requiring observation.

The number of deaths from Cholera was only eleven during the whole quarter, being 466.8 below the average of previous years. It will be seen from the appended return (Table V) that only one case was witnessed in the first eleven weeks of the quarter. Two cases occurred in the twelfth week and one in the thirteenth. The first of these was a sporadic case occurring in

Cholera.			
1860	...	...	327
1861	...	...	614
1862	...	...	1,341
1863	...	...	133
1864	...	...	34
1865	...	...	208
1866	...	...	638
Total...			3,345
Average...			477.8

the district of Poodoopaukum. The second was a case of a man who was attacked at a place near Chingleput and died at Narasingpooram in a few hours after his arrival. Of the third case no particulars are known, but the disease did not spread. The fourth case occurring in the week ending 27th December was that of a man who died at Moothalpettah shortly after his arrival from Trivellore, where he was attacked with the first symptoms of the disease. In addition to the foregoing cases, seven others occurred in the four concluding days of December; these cases are shown in the general Table IV, but do not appear in the "thirteen weeks' Return," in which, on the other hand, three days of the month of September are included. In order to avoid the discrepancy which so constantly occurs from one table being calculated by the calendar quarter, and the other by periods of thirteen weeks, which seldom, if ever, are actually coincident with the extent of the calendar quarter, I purpose in the returns for 1868 and subsequently, to frame all Tables of Mortality strictly by the calendar quarter.

The seven cases noted above which appear in one, though not in the other, of the accompanying Returns, would appear to have been referable to an extension of the disease from the patient who died in Moothalpettah. In this place we

must, taking into consideration the number and rapid succession of cases, consider the disease to have assumed an epidemic type. With this exception, however, Madras may be said to have enjoyed a complete immunity from epidemic cholera from the period embracing from 1st of April to 24th December. This case, as before noticed, was an imported one, but unfortunately set up the disease in epidemic form, the extension, repression, or cessation of which will form a subject of future report.

[NOTE.—I may here notice that by recent arrangements immediately I am in receipt of any report of death from cholera, all particulars as to the name and residence of the deceased are without delay communicated to the Municipal Commissioners. Their Sanitary Inspector has been so kind as to direct my attention to two cases in which there was reason to doubt the perfect accuracy of the Mortuary Reports collected by the conicopolies of this office. The following observations will shew that occasional revision of the weekly returns, as published in the *Fort Saint George Gazette*, may be required. But in all such instances resulting in alteration in numbers, I shall bring such correction to notice and explain the grounds upon which it was made.

(I.) A case, reported in the first instance as of cholera, from the General Hospital, Madras, has, with the assent of the Inspector General Indian Medical Department, been removed from under this head. It occurred in a patient laboring under fever of a character closely allied to cholera and which is frequently attended with that symptom which alone rendered it at first probable the death was due to cholera. This symptom (colliquative serous purging) was witnessed only an hour before the patient's death, while the absence of other usual symptoms of cholera rendered the causation of this symptom by this disease exceedingly questionable. The patient had been ill for some days, and in the absence of special epidemic influence, the termination of his illness by cholera would have been improbable. No other case of cholera was witnessed in the General Hospital antecedent, or subsequent, to that noticed above.

(II.) A second doubtful case has also been omitted from these returns; it was that of a European woman, aged 25 years, resident in Pursewalkum, and who was reported to have died from cholera. On enquiry, however, which was promptly instituted by the Sanitary Inspector of the Municipal Commissioners, it was found that the woman had died af-

ter a protracted drinking bout, followed by extreme nervous prostration, but not presenting the symptoms of cholera. As in this instance there is an apparent object which might render misrepresentation, as to the real cause of death, to be desired by the friends of the deceased, I have considered myself justified, after the full enquiry conducted as noticed above, in transferring the death to the heading "Nervous Disease."

(III.) A third doubtful case was brought to my notice by the Sanitary Inspector of the Municipal Commissioners, but this case I have not felt myself justified in interfering with, as I consider that the preponderance of evidence pointed to the possibility of its really being a case of cholera supervening upon other disease.

With reference to the last two cases alluded to, I think it well to direct the attention of Government to the great advantage which I trust will follow upon the early report to this office, and the prompt communication to the Sanitary Inspector of the Municipal Commissioners, of the occurrence of epidemic disease within the limits of Madras. Immediately on receiving from me intimation of the occurrence of cases of cholera, small-pox, &c., the localities in which these may have occurred are visited by the Sanitary Inspector, who at once, under the authority of the Commissioners, adopts measures for the whitewashing, cleansing, &c. of the possibly infected quarters. I am not without hope that the careful pursuance of this mode of action will, in many instances, prevent the development of epidemics of the more serious contagious diseases, a result which in a city so densely populated as Madras, is of the highest possible importance.—H. B. M.]

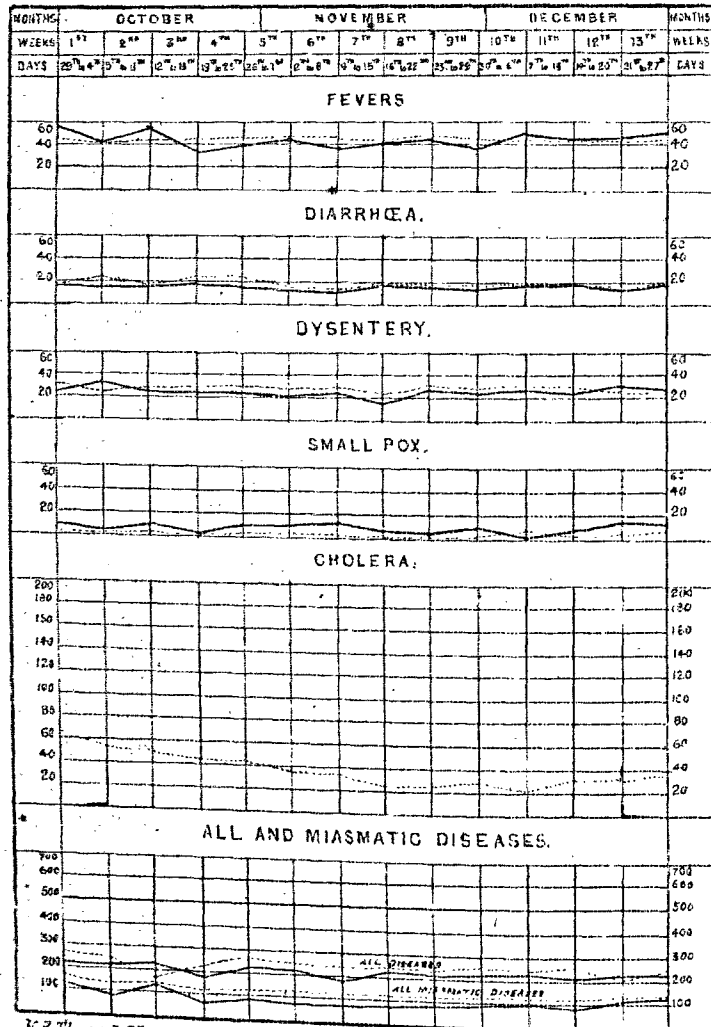
TABLE V.—*Shewing the Mortality from Miasmatic Diseases in the last 13 weeks.*

	Oct. 4.	Oct. 11.	Oct. 11.	Oct. 25.	Nov. 1.	Nov. 8.	Nov. 15.	Nov. 22.	Nov. 29.	Dec. 6.	Dec. 13.	Dec. 20.	Dec. 27.	Total.
Fever.....	40	57	32	33	42	34	40	41	39	48	46	48	48	552
Diarrhoea.....	13	12	19	17	14	13	17	16	12	15	16	11	14	189
Dysentery.....	33	23	23	23	20	22	19	23	23	21	30	30	28	317
Small-pox.....	4	10	4	6	9	13	8	7	10	1	...	15	14	110
Cholera.....	1	...	...	...	...	...	...	...	...	...	...	2	1	4
Other Miasmatic Diseases.....	5	8	4	6	3	4	4	5	8	7	6	3	8	17
Total Miasmatic Diseases.....	96	110	82	90	88	86	88	92	92	100	98	109	113	1,344
All Diseases.....	206	226	195	212	204	149	218	203	206	217	214	232	230	2,762

Average of the corresponding weeks for 7 previous years.

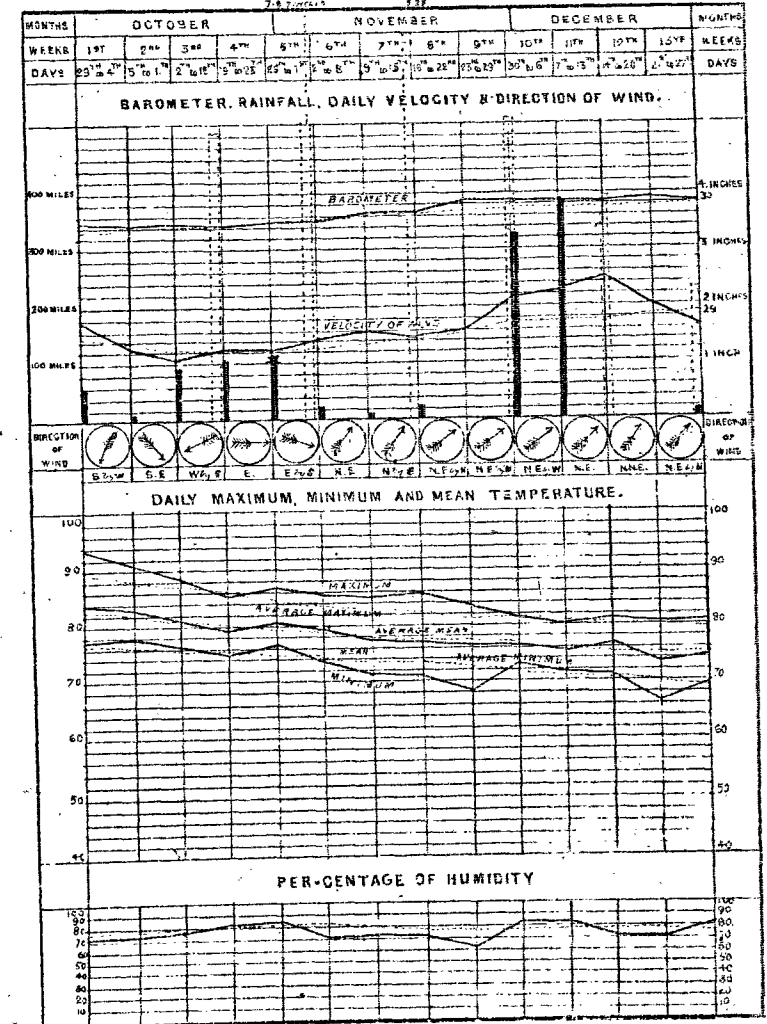
Fever.....	41·5	44·5	43·9	47·9	44·5	46·5	43·9	42·2	43·6	47·3	43·4	42·5	42·0	574·7
Dysentery.....	21·9	19·5	18·2	21·8	21·2	16·8	17·5	18·9	16·3	15·9	16·7	17·7	17·0	240·3
Diarrhoea.....	26·5	25·5	24·6	28·8	25·2	24·5	25·5	26·1	28·6	26·8	27·5	26·6	22·9	339·1
Dysentery.....	2·0	2·4	2·2	1·1	1·5	2·4	3·2	2·6	1·9	2·7	2·4	2·9	4·9	32·2
Small-pox.....	53·4	49·8	42·0	40·9	35·5	31·9	23·6	25·5	27·3	25·1	31·1	31·2	40·5	457·8
Cholera.....	1·7	1·6	2·5	1·4	2·1	3·4	1·6	2·8	2·5	3·1	3·0	1·4	1·7	29·0
Other Miasmatic Diseases.....														
Total Miasmatic Diseases.....	147·0	143·5	133·4	141·9	130·0	125·5	115·5	113·1	120·2	120·9	124·1	122·3	130·9	1673·1
All Diseases.....	254·1	232·9	248·7	257·1	248·3	236·5	230·4	231·9	241·2	232·3	233·8	230·7	239·7	3053·5

DIAGRAM SHOWING THE MORTALITY FROM MIASMATIC DISEASES
IN MADRAS
DURING THE 4TH QUARTER 1867.



N.B. The total Mortality from each disease during each week is plotted on the perpendicular lines which represent these periods. The horizontal dotted wave lines show the average mortality from each disease for the previous seven years.

DIAGRAM SHOWING THE METEOROLOGICAL CONDITION
OF MADRAS
DURING THE 4TH QUARTER 1867.



N.B. The mean weekly Meteorological elements are plotted on the perpendicular lines. The dotted wave lines show the bimonthly average for twenty years from observations kept at the Madras Observatory.

Mean Meteorological Observations for the past 13 weeks.

	29-812	29-859	29-113	29-856	29-836	29-939	29-957	30-049	30-049	30-042	30-014	30-038	30-008	Average
Barometer reduced to 32° F.	91.0	88.5	85.2	86.4	85.8	85.1	85.3	83.7	81.1	80.3	80.3	80.0	80.5	29.945
Mean Maximum Temperature	78.0	76.9	75.0	76.4	73.6	71.2	70.9	68.0	72.8	71.7	71.5	66.1	68.8	72.3
Do. Minimum	...	83.8	81.7	80.9	78.7	77.8	77.0	76.3	76.1	75.4	76.1	73.0	74.1	77.6
Do. Temperature	...	72	84	85	72	72	71	63	84	82	72	71	81	76
Do. Humidity	...	S. by	S. E.	E.	E. by S.	N. E.	N. by E.	N. E.	N. E.	N. E.	N. E.	N. E.	N. E.	E. by N.
Prevailing Wind	...	W.	S. W.	S.	S.	N. E.	N. by E.	N. by N.	N. by N.	N. by N.	N. E.	N. E.	N. E.	N. E.
Mean velocity in Miles	...	132	115	127	152	159	148	164	215	223	249	195	167	176
Rain-fall	...	0.15	0.90	1.14	0.28	0.11	0.24	..	3.38	3.84	...	...	0.18	11.29
														(Total)

Table shewing the Mean Half-Monthly Meteorological condition of Madras, for 20 years past—1841-1868.

	Half month ending 15th October.	Half month ending 31st October.	Half month ending 15th November.	Half month ending 30th November.	Half month ending 15th December.	Half month ending 31st December.	Average.
Barometer reduced to 32° F.	29-822	29-873	29-914	29-950	29-957	29-996	29-918
Mean Maximum Temperature	86.5	84.2	82.3	81.1	80.1	79.5	82.2
Do. Minimum	75.9	74.3	73.1	71.7	70.8	69.5	72.5
Do. Temperature	80.0	79.0	77.6	76.2	75.3	74.5	77.2
Do. Humidity	81	82	77	78	79	76	79
Prevailing Wind	S. by E.	N. E.	N. N. E.	N. N. E.	N. N. E.	N. N. E.	N. E.
Mean velocity in Miles	120	127	146	177	180	187	156
Rain-fall	5.08	7.87	6.28	5.52	3.98	2.33	31.06
							(Total)

The Meteorological condition of Madras is fully shown in the foregoing table and the accompanying diagram.

This averaged during the quarter 29.945, being .190 above that of the previous quarter, and .027 above the average of twenty previous years. The highest pressure recorded during the quarter was during the eighth and ninth weeks when it rose to 30.049; the lowest point to which it fell was (in the first week) 29.812. The barometer showed throughout the quarter a general tendency of rise, and terminated .196 higher than at the commencement of the quarter. There were no very marked fluctuations at any time, and it is observable that the higher range of the barometer was coincident with the falling of heavy rain in the ninth and tenth weeks.

The heat during the quarter was beyond the average, a similar excessive heat having been noticed in the previous quarter. During the first seven weeks of the quarter the thermometer was very high, varying from 91.0 to 85.1. During this period the general tendency was, however, towards a decrease of temperature which was probably due to occasional partial showers; but after the heavy rain experienced in the ninth and tenth weeks, the thermometer rapidly fell and remained at about 80 to the end of the quarter. The mean temperature was, like the mean minimum temperature, only slightly in excess of the experience of twenty previous years.

The mean humidity averaged 76 per cent., which was 3 less than that in the fourth quarters of twenty preceding years. The largest amount of humidity was witnessed in the third and fourth and ninth and tenth weeks. In the first of these two weeks diarrhoea was unusually fatal, otherwise there does not seem to be any connection established between the hygrostatic condition of the atmosphere and the prevalence and fatality of disease.

The prevailing wind blew from East by North, its velocity being eleven in excess of the average of previous years.

The rainfall during this quarter which usually amounts to upwards of 31 inches only amounted to 11.29. Unless this should be supplemented by heavy rain early in the

Rainfall.

year 1868, it is but too probable that the water supply during the next hot weather may be inadequate to the requirements of the population of this large city. It is not necessary that I should dwell upon the advantages to public health which may reasonably be looked for, should an ample and pure supply of water be made available for the inhabitants of Madras.

No. 22.—*Sanitary* Report on the Great Hurdwar Fair of 1867.*
By Assistant Surgeon H. C. CUTCLIFFE, F. R. C. S.

I.—SANITATION.

THE sacred bathing ghât to which the Hindu pilgrims resorted during the Koombhke-Melâ of 1867, was at Hurdwar, a Native town situated on the banks of the Ganges in latitude 29° 57' and longitude 78° 15', and at an elevation of about 1,000 feet above the level of the sea.

The vast concourse of people present at the Fair was located in the valley of the Ganges, for a length of above nine miles and a breadth of from two to six miles, from above the bund at Doodea past Hurdwar and Myapore, to below the towns of Kunkul and Joolapore.

The valley of the Ganges from where the river escapes from the Himalaya Mountains at Rikikase (about thirteen miles above Hurdwar), to a distance of several miles below Hurdwar, consists of a deep stratum of gravel and boulders intermixed with lime-stones of various sorts.

The boulders become smaller in size as the distance from the hills increases, until, at about 17 miles below Hurdwar, they are lost in a stratum of sand and silt.

These boulder strata are generally in the higher levels, covered with lighter alluvial deposits and mould, and clothed with vegetation.

The direction of this valley is nearly north-east and south-west.

The town of Hurdwar is situated in the gorge of the Sewallick Hills, through which the River Ganges flows.

These hills are of tertiary formation, and are composed of

* From 'Gazette of India'—vide Review No. 2 in this Volume.—ED. M. Q. J.

massive strata of grey sand-stone, covered in parts with a superstructure either of clay or of loose boulder gravel.

The low flat mounds on either side of the river bounding the funnel-like opening from the gorge into the Doon, are formed of a superstructure of clay, resting on another stratum of boulders or of conglomerate rock.

From Hurdwar up to Rikikase, this valley is surrounded by dense uncleared tree forests, with heavy brushwood and rank grasses, and in it, here and there, are large and deep swamps; and it so teems with malaria that even the Natives can, with impunity, reside in it only from the month of December to the beginning of the rainy season.

In the valley below Hurdwar, though there is less jungle, there is much malaria. *

At and below Hurdwar, the level of a considerable part of this valley is so low that much of it is overflowed during the rains. The sub-soil water, percolating from the river, is at no time more than a few feet below the surface of the low ground.

Through this funnel-like gorge at Hurdwar blows at night with great force the cold wind, locally known as the Dadoo, from off the snowy regions of the Himalayas, down to the heated plains below. The direction of this night wind is steadily from north-east to south-west.

In April, it commenced to blow about 9 P.M. and ceased at about 10 A.M. By day the current of an air is chiefly upwards towards the hills. In this locality, typhoons are of very frequent occurrence at this season of the year.

The daily mean temperature from the 7th to the 14th of April was 76°. *

With a desire to obtain, if possible, certain data on which to form some sort of estimate of the probable number of people present at the Fair, I succeeded, by the obliging assistance of two very intelligent Europeans, in having three different spaces in the encampment on Roree marked out, and their superficial area accurately measured.

Between 7 and 8 P.M. on the evening of the 9th of April, the population of these measured spaces was carefully taken with the following results:—

Feet.

Population.

No. 1,—150 by 78, ground thinly encamped on.	225
" 2,—200 by 300 do. thickly do.	1,185
" 3,—350 by 300 do. moderately do.	800

Total... 700 by 678.

Total 2,210

The sum of the measurements and the sum of the population would represent something like an average of population to space. We may say, then, that an average space of 700 by 678 feet, or 474,600 square feet, or 52,733 square yards, contained a population of 2,210 people. Now, since 52,733 square yards contained 2,210 people, 3,097,600 square yards, or one square mile, should contain 129,818 people. The entire length of the encamping ground was nine miles, and I think that the mean breadth may be taken at three miles. This would give 27 square miles of encampment. Now, if we deduct from the 27 square miles about one-fourth for ground which was not occupied, we may assume that the remainder, or say, 22 square miles, represent the amount of ground actually encamped on. These numbers will not, I think, be considered excessive by any one who was familiar, as of course I was, with the whole of the encampment.

Now, if for one square mile we have 129,818 people, for 22 square miles we shall have 2,855,966 people; and this figure probably represents the number of people actually present at the Fair.

The whole encampment was divided, by the river, the land, and by pre-existing roads, into sections, through each of which longitudinal streets of from 50 to 100 feet in breadth, ran nearly in the direction

The encampment.

of the prevailing winds, and were intersected, at intervals, by transverse and smaller streets. The whole ground was thus mapped out into sections, and sub-divided into blocks, which were separated from one another by streets that served as channels of air and prevented overcrowding, and afforded complete ventilation to the entire camp; arranged in order within the blocks, the pilgrims sheltered themselves in neat and most picturesque-looking grass huts.

Since to drink the sacred waters of the Ganges was as much an object of the pilgrims as to bathe in its stream, sanitary efforts on this subject could alone be directed, with

Drinking water.

any possible use, to an endeavour to prevent contamination of the river, along the banks of which patrols of Police were kept up from Rikikase downwards, and the throwing into it of dead bodies was everywhere strictly prohibited.

The conservancy arrangements further assisted in preventing the pollution of the water.

By the precautions of the Magistrate, the *bunneahs* were deterred from adulterating their flour, which, of good quality, could be abundantly obtained.

Orders were issued by the Commissioner to the Magistrates and the Police Officers in Stations around Hurdwar to arrest all small-pox and cholera patients, and to prevent them from getting into the Fair. Strict orders were also given to the Police at the Fair to seize all small-pox and cholera patients, and to send them with their families to the hospital set apart for them.

A very close scrutiny of the pilgrims was kept up by the Police. About the 25th of March they found some four cases which they thought were cholera, and duly reported them as such. My attention was drawn to them by the Magistrate of Saharunpore, and I got them taken to Hospital, and found that they were not cases of cholera. Though the nature of the diseases had been mistaken, the incident well illustrates the attention of the Police to the orders on the subject now under remark. A system of visiting the patients in their huts was also kept up by a staff of medical subordinates detailed for this special duty.

II.—CONSERVANCY.

A conservancy system was enforced by rules which were based chiefly on the following principles:—

1st.—That the principle of dry earth conservancy should be everywhere adopted;

2ndly.—That all filth, from whatever sources, should be, as quickly as possible, disposed of either by—

(a). Burying it in trenches, or

(b). Burning it in furnaces, *i. e.*, by rapid combustion;

3rdly.—That decently screened latrines should be provided in situations convenient to the people;

4thly.—That no latrine or trench should, on any account,

be made on ground which at any time could form any part of a water-course; and,

5thly.—That dead bodies of animals should be speedily buried in graves of six feet deep in grounds selected with similar restrictions.

For the convenience of the people, a latrine, with roads leading to it, was constructed in, or adjacent to, each of the blocks of the encampment. The size of the latrine

depended on the nature of the ground and on the number of people who were expected to use it. An ordinary latrine occupied a piece of ground 60 yards long by 20 yards broad. It was surrounded by a screen fence six feet high, for the construction of which various materials were tried; but the most efficient and probably the most economical of all screens proved to be a thatch screen, or chopper, supported by bamboos. The latrine was divided into two parts by a partition wall, so situated as to allot two-thirds of the entire length of the latrine for men, and one-third for women; and each division was provided with a separate and screened entrance.

Where the nature of the ground admitted it, the latrines for the two sexes were erected apart from one another. Nearly all the latrines were situated on an earth

soil, or on such an admixture of earth and sand as admitted the digging of transverse trenches one foot broad and four feet deep.

Two such trenches with an interspace of two feet were dug at a time, and the earth which was thrown up in forming them was stored for future use on one edge of each trench.

Having squatted himself with one foot on either side of the trench, and having thrown in a handful of earth before leaving, the visitor himself reduced the labour of the attendants to a minimum, and left nothing objectionable either to his neighbour or his successor.

But in certain few and exceptional cases, it was absolutely necessary to provide latrines on sand and boulders, where the trench system could not be worked. In these

latrines, having removed the stones, earth was thrown down to absorb fluids, and to deodorize the filth which having been covered with earth, was carried to the furnaces either by the sweepers, or by donkeys or mules, which returned again to the latrine laden with dry earth.

In the compounds of the houses of private individuals, and within private enclosures, private latrines were permitted to be erected; but their owners were held responsible that the conservancy rules were strictly obeyed. These latrines were for the most part worked on the principles of the sand latrines, *i. e.*, without trenches. Private individuals were permitted to erect private screens or partitions within the enclosures of any of the public latrines. Tatties or private latrines, other than those now mentioned, were strictly prohibited.

For each ordinary single latrine, when completed, two sweepers and two diggers sufficed.

Conservancy staff. For each sand latrine, six sweepers, besides the conveyors of the filth, were required. There were about nine latrines to each Police Chowkee; and over these nine latrines and their attendants was appointed a jemadar sweeper, who was made to understand the very simple conservancy rules, and was held responsible that they were carried out by all the sweepers under him.

The head policeman at each Chowkee enforced these rules under the orders of the Police Officer of the section. I had under me a Deputy Sanitary Officer, Mr. Garden, Inspector of Police, who, with indefatigable zeal, kept under his inspection the conservancy arrangements of the whole encampment which I myself superintended.

To ensure rapid combustion and thereby to diminish as much as possible the bad smells which result from the burning of filth, four furnaces were erected. Two of these were built in nullahs running up directly from the town of Hurdwar, and served for the combustion of all the filth deposited in and about the town. The other two were on the island on the opposite side of the river. They were so situated that the smoke from none of them could blow over the people. These furnaces were erected by Mr. Jones of the Canal Department, who, by his most kind and

Furnaces.

* * *

obliging assistance, rendered valuable aid in many cases of difficulty. A charge of wood was first thrown into the furnace and then the filth was piled on with, now and then, a small amount of fresh fuel so as to support combustion.

The burden of enforcing the conservancy rules fell on the Police, and it is to the unremitting exertions, the most cordial co-operation, and kindly aid offered me on all occasions by the Civil authorities, and by Major Watson in charge of the Police, and by the Police Officers acting under him, that the simple system of conservancy which I have briefly sketched, sufficed to make clean the three dirty Native cities of Hurdwar, Kunkul, and Jooalapore, and to maintain in cleanliness, and in freedom from bad smells, a collection of Natives computed at about three millions.

III.—HOSPITAL ARRANGEMENTS.

Hospitals were required in different parts.

In the Deyrah section a hospital, capable of accommodating 20 patients, was erected and was taken charge of by Dr. Richardson, Civil Assistant Surgeon of Deyrah, on the 28th March.

In the Bijnour section, another hospital of similar size was erected, and was taken charge of by Dr. Gardner, Civil Assistant Surgeon of Bijnour, on the 3rd March. These two hospitals were supplied with medical subordinates and medical stores by the Medical Officers in charge, to whom I am much indebted for their valuable assistance.

On the island opposite Hurdwar, and immediately facing the bathing ghât, was erected a dispensary; and on a high bank, commanding a constant current of air, at the south-end of this island, No. 2 Hospital, capable of containing 50 patients, was erected.

The Island of Row.

Myapore.

On the opposite side, near the Myapore Bungalow, and on the high spoil (*sic*) bank of the canal, was erected Hospital No. 1.

Hurdwar.

In the Police lines in Hurdwar, a hospital for the accommodation of 20 patients was erected.

Kunkul.

At Kunkul a small dispensary was provided.

A hospital, capable of containing 25 patients, was erected at Jooalapore, adjacent to the Saharunpore Branch Dispensary there situated.

Between Myapore and Jooalapore, on a large piece of ground admirably secluded by rows of bamboos and bounded on one side by the canal, was erected Hospital No. 3 for infectious and contagious diseases, capable of containing 60 patients.

The ground taken up for this hospital afforded ample space for the separate huts of those private individuals who chose to erect them at their own expense.

The whole space was cordoned by Police, who themselves were not allowed to come within 40 yards of the hospital.

In the Deyrah section, another hospital for infectious and contagious diseases was erected.

A uniform plan was adopted for the erection of all the hospitals, which were constructed of thatch work or chopper, supported by strong and firmly-set beams and poles, capable of resisting the powerful night winds, or even the typhoons which were to be expected. These thatch buildings were 20 feet broad, 6 feet in the upright sides, and 13 feet high to the top of the pent roof. In length they varied in accordance with the nature of the ground; but no building was anywhere constructed to contain more than 30 patients. As many of these separate buildings as were required, were erected in Echelon at 20 yards' interval from one another, and were so disposed with regard to the direction of the prevailing winds, that air blew transversely through each building, and in no case from one to another building. The sides of these buildings were provided, at intervals of 12 feet, with openings 4 feet in breadth, which could be closed by doors so as to regulate the admission of air into the building. Within the building a central pathway of six feet in breadth was marked out, and the beds were regularly arranged on either side.

Under each bed, a layer of dry fresh earth was strewed. At one end of a building a small space was enclosed for a Dispensary: at the other end, a portion of the building was divided off by a thatch screen for a female Hospital. One of these buildings, 100 feet in length, contained 19,000 cubic feet of space, and was intended for 25 patients, each of which would have had about 750 cubic feet of space. Materials were stored in readiness to increase the Hospital accommodation, should more than what was already provided have at any time been required.

Medical stores and Hospital furniture.

European medicines, sanctioned by the Inspector-General of Hospitals, were obtained from the Umballa Medical Depot.

Native medicines, which were chiefly used, were obtained through the Magistrate from local sources. Surgical instruments and appliances were temporarily supplied from the Medical Stores at Saharunpore. A barrel of carbolic acid for the use of the Hospitals was obtained from the Meerut Jail and proved to be of very great service, as a most efficient deodorizer and as a repeller of flies, which, whenever it was used, were invariably very greatly diminished in number. Beds, blankets, and all requisite Hospital furniture, as well as food for in-door patients, were supplied by the orders of the Magistrate.

Four Native Doctors and four Compounders were detached from Saharunpore; three Native Doctors were sent from Roorkee; twenty Vaccinators were sent from the Kumaon and Meerut Divisions.

Filters of sand and charcoal were provided for the Hospitals, which, for the most part, obtained good drinking-water from adjacent wells.

For the conveyance of sick or injured persons, common native beds, provided at both ends with cross-sticks, by which they were suspended on a pole, were distributed, with their bearers, to every Police Chowkee, to the Dispensaries and Hospitals, and to spots adjacent to the sacred bathing ghât.

A dooly that had conveyed a patient with a contagious

disease to Hospital No. 3, was there detained, and the carrying poles having been removed, the bed was used for the patient to lie on in Hospital.

The dead bodies from the General Hospitals were removed to the Hindu Sacred Burning Ghât at Kunkul, and were there burned. But a special burning ghât,

supplied with stores of dry wood, was provided for the bodies taken from the Contagious Diseases' Hospital, and arrangements were made with the Brahmins for the satisfaction of the religious scruples of the family of the deceased. A Native medical subordinate had to attend the burning of the bodies, and to see that they were thoroughly consumed by fire.

IV.—MEDICAL HISTORY OF HURDWAR FAIR.

An ordinary and regular Fair is annually held at Hurdwar on the 11th of April. Every twelfth year there is a Koombh, which is the largest of all the Fairs, and every sixth year a Koombhane, which is smaller than a Koombh. Certain other annual Fairs are held, of which "Duserah" occurs in June, "Sheoratee and Hoolee" in March, "Dewallee and Natgee" in November and December, "Lorhee" in December, and "Manimawesh" in October or November. But besides these regular festivals, large extraordinary Fairs, called Mahabarnee and Barnec, take place on the occasions of solar or lunar eclipses, provided that they occur with certain conjunctions of stars, and within what is considered to be a propitious period. The numbers attending these ordinary and extraordinary Fairs vary from 100,000 to 3,000,000.

It is said that in 1783 an epidemic of cholera destroyed 20,000 people at Hurdwar in eight days. The Pundits seem only to know that a great mortality occurred at that year's Fair—the eighth Koombh from the one now just past. In 1819, the Pundits state that a plague occurred at the Hurdwar Fair, and destroyed a vast number of people, and that it was in 1827 that they first knew of cholera at Hurdwar. In the Fair of 1829, when the Goosains (Fakeers), after struggling and fighting for a forward place, came down the steps of the Sacred Ghât to bathe, it is said that a hot blast of wind blew on them, and that, in an instant, all who were present at the ghât fell dead. The belief is that an offended deity thus punished these fakeers for their presumptuous sin in daring to take precedence of more worthy pilgrims.

But the mortality was subsequently very great in the encampment. I am informed by a Native Doctor, who was present at the Fair of 1857, that cholera then again made its appearance. From 1857 to 1867, cholera does not seem to have occurred at Hurdwar. But as I was only appointed to Saharunpore in March last, I have no personal knowledge of former Fairs, and my statements concerning them are based on what information I have been able to obtain from intelligent and respectable Pundits, and other Natives of Hurdwar and Saharunpore. I can find no records to refer to.

In obedience to orders received from the Commissioner of the Division, I proceeded to Hurdwar and assumed charge of the sanitary duties of the Fair on the 12th March.

In the end of March many thousands of pilgrims came to Hurdwar, and after remaining a few days, departed again. From the 1st of April, the people began to arrive in vast numbers from the plains, and to settle themselves down in the blocks laid out for them. On the 3rd of April the Fair may be said to have commenced, though dense living streams stretching backwards for very long distances into the plains, and with a volume steadily increasing up to the auspicious bathing hour of 12 M, on the 12th of April, continued to concentrate themselves in Hurdwar, and to pour out their multitudes on the encamping grounds. But from that hour, in the vast surging mass, a new direction of current was observable: for the Hindoos, as soon as they had bathed, began to depart, and the roads which before the bathing hour had been so crowded with people pressing in towards Hurdwar, were now again choked with pilgrims returning to their homes. The rapidity with which the throng dispersed is inconceivable. Dr. Richardson reports that on the afternoon of the 13th there were not 300 people remaining in the Dehra section. By the same time, the Bijour section was empty; and on the morning of the 15th, the entire ground, so lately covered by the encampments, was a bare plain again.

One could not fail to remark in the crowd the large proportion of decrepid old people, tottering along, supported by their faith and by their hope of being made eternal.

Accidents.

ly happy by a death at the Sacred Ghât. The number of infants in arms was likewise very great. It is to the most admirable and complete arrangements of streets, and the perfect subjection of the crowd to a systematic and orderly direction, that the almost total absence of accidents is due.

The total number of deaths from accidents was 5, and of these two were killed by lightning.

Medical Returns. Of small-pox, fourteen cases were detected and sent into hospital, where three died, and 11 recovered. The total number of sick treated in the General Hospitals was 544, of which 16 died and 528 recovered, and 16 were remaining.

The total number of out-patients treated at the hospital was 823. The prevailing sickness was malarious fever, of which 238 cases were treated. The number of diarrhoea and dysentery cases treated in all amounted to 180. Dr. Richardson states in his Report that no case of cholera or of small-pox occurred in the Dehra section up to the 14th; and Dr. Gardner's Return shews a similar absence of either of these diseases in the Bijnour section up to the same date. Dr. Kendall, in medical charge of a detachment of the 14th Bengal Cavalry, stationed below Kunkul, states that a case of sporadic cholera occurred on a grass-cutter of his regiment on the night of the 9th of April. Under treatment, this man speedily recovered, and no other case occurred in the regiment at Hurdwar. Of all the hospitals and dispensaries at Hurdwar, the Medical Returns shew an absence of the disease up to the 13th of April.

The inference from the Medical Returns is that the whole encampment was remarkably free from sickness, and my own constant observation, and that of the other Medical Officers, confirms this inference. It was a palpable fact, observed by all who were much in the crowd, that the pilgrims looked remarkably healthy, cheerful, and happy; and that, whenever they saw a European, they never ceased vociferating their grateful praises of the Government that had been so kindly thoughtful in providing for their safety and comfort.

In March, the temperature had been unusually high till a storm or two with rain cooled the air, and the weather then remained fine and pleasant up to the 11th of April, which was a cloudy, close day, with the usual wind blowing upwards to the hills, till the

Information relating to the outbreak of cholera.

afternoon, when a heavy storm of thunder and very vivid lightning, coming from the west, broke over Hurdwar, where two men were killed by the electric fluid, and four others were severely burned. Heavy rain fell, and continued all night. The 12th was the great day for bathing, and the pilgrims, who had been wet for twelve hours, began, before the dawn of day, to stream off in thousands to the sacred ghât. The rain still continued to fall, though now only lightly; nor did it cease till the evening, when just before sunset, the clouds broke, and the sun, for a short time, came out. But the pilgrims had been out for twenty-four hours, and, after bathing and drinking the much-polluted water at the ghât, a vast number must have waited, in a state of fatigue, till the sun came out, ere they could have got any dry clothes on their bodies. On the following day, April 13th, eight cases of cholera were sent to hospital.

For the existence of a specific disease, whether it be small-

Specific diseases.

pox, scarlet fever, hooping-cough, or cholera, the presence of its own specific poison is necessary. Whether the specific poison or agent of cholera was present amongst the crowd or not before the occurrence of the disease, there is no proof. We are only made aware of the presence of this most subtle element by the effects that it produces on the human body.

Presence of the specific poison.

Since the specific disease, cholera, occurred at Hurdwar, the specific poison or agent of the disease must have been either—

- 1st.—Spontaneously generated; or
- 2nd.—Have pre-existed on the spot; or
- 3rd.—Have been imported there.

- 1st.—The hypothesis of the spontaneous origin of the agent of a specific disease, is as untenable as is that of the spontaneous generation of an animal.
- 2nd.—A supposition of the existence of the cholera poison at Hurdwar, must rest on the fact that the disease has several times shewn itself there at former Fairs. But cholera has not been endemic at Hurdwar; nor has it occurred, so far as I can ascertain, for the last ten successive Fairs. This, however, does not prove the absence of the poison; for certain known, and

probably many, unsuspected conditions are necessary to its development.

How long this poison of cholera may remain dormant, we know not. It has shewn itself in old camping grounds that have been deserted for weeks and months, as it has been conveyed in a dormant state over great distances for as long a period of time. But facts have not demonstrated the effects of time in modifying or destroying the cholera element.

3rd.—That the specific agent of cholera can be conveyed by people passing from an infected district, is a well known fact. Now cholera occurred at the Agra Durbar in November, and it prevailed as an epidemic at Benares and in Rajpootana, at or about the time of the Hurdwar Fair, and, since pilgrims came from these places, it is probable that they conveyed with them the cholera poison or agent to Hurdwar.

But though cholera commenced in the vast crowd at

Cholera amongst the pilgrims at Hurdwar was slight.

Hurdwar, it made almost no progress amongst the people until they had dispersed. The total number of cholera patients admitted into the hospital at Hurdwar up to the evening of the 15th, was nineteen; and the total number of deaths, eleven. By the evening of the 15th the pilgrims had all departed; and it was when they had left Hurdwar, and were beyond all sanitary control, that the disease began to spread amongst them. At former Fairs, as I have previously shewn, when cholera broke out, it destroyed the pilgrims in great numbers at Hurdwar itself; and since the laws which the disease observes in relation to crowds are known to be everywhere alike, we may be sure that it would this year have produced a terrible havoc in so vast and dense a multitude as were present at the Kumbh, had it not been for the very com arrangements that opposed both its outbreak and its diffu.

It is clear that hygiene is the greatest antagonist that can as yet oppose to cholera; that impure water and food are its great supporters; that diarrhoea and general debility, whether produced by exposure and over-fatigue, from whatever source, are the chief pre-disposing causes of its attack; and that the disease is capable of communicating itself through the medium of the excreta, and specially of the fæces, to others fit to receive it. But though we have given

the cholera poison or agent, and the conditions which establish for it a nidus fit for its development, we yet seem to require the right reason for its maintenance as an epidemic.

The favorite season for the diffusion of cholera as an epidemic appears to be, in England, autumn; in Russia and in France, winter; in Bengal, the early spring; and in the North-Western Provinces, the rainy season.

It was after the rain of the 11th and 12th of April, that the epidemic of cholera commenced at Hurdwar.

The pilgrims, after leaving Hurdwar, conveyed with them, as their subsequent history shews, the cholera poison; they underwent great fatigue and exposure during their long marches; and, as fresh parties came on, they had to pass along roads and to encamp on ground strewn with the evacuations of those who, suffering from the disease in various degrees, had preceded them.

These appear to be chiefly the circumstances which permitted the disease to propagate itself amongst the pilgrims after they had left Hurdwar.

That cholera (as I shall presently shew) did not spread itself widely as an epidemic amongst those who were in circumstances other than those of the pilgrims, may be due to the season having been unfavorable to the general diffusion of the disease and its maintenance as an epidemic.

On the occurrence of the epidemic on the 13th, I reported the circumstance to the Magistrate of Saharanpore, and I telegraphed to the Principal Medical Officers of Lahore, Umballah, Delhi, Bareilly, Roorkee, Meerut, Agra, and Allahabad, and I wrote to Deyrah, warning all that several cases of cholera had occurred amongst the pilgrims at Hurdwar.

The well known cholera pills were distributed to all the Police Chowkees, and to all the Medical Subordinates employed in looking for cases amongst the crowd; and I doubt not that these pills did much good, when they were given in the stages of the disease preceding collapse. In addition, antispasmodics, cordials, and opium were given in the early stages. When collapse came on, ammonia and stimulants were prescribed. The cases sent to Hospital No. 3 were nearly all, on their arrival, in a moribund state.

On the whole, it appears that the type of the epidemic in this district has not been a very fatal one, and that, in the early stages, the disease has been very amenable to treatment of no extraordinary nature whatever.

All due precautions were, in course, taken in burying the evacuations with all speed, in burning the clothes of the dead, and in boiling those of the patients who were discharged cured, and in attending to all the familiar details of precautionary measures against the spread of the disease from the hospital.

On the evening of the 15th, the pilgrims having deserted Hurdwar, I with the concurrence of the Magistrate, made medical arrangements both at the Jooalapore and at No. 3 Hospital for the continuance of medical relief, and started for Saharunpore, where cholera and the pilgrims had arrived before me. The country was empty of pilgrims until I came near Roorkee, when I got up to the rear of the retreating crowd. I reached Saharunpore on the 16th, and found that the Joint Magistrate had taken the precaution of preventing the pilgrims from coming into the station by turning them off the main road, and sending them round towards their destination by a circuitous route.

On the 13th a case of cholera occurred at Bhugwanpore, 23 miles from Hurdwar. By the evening of the 14th, the pilgrims had begun to arrive at Saharunpore—distant 38 miles from Hurdwar—and 14 cases were treated from the Saharunpore Dispensary. On the 15th, 27 cases, on the 16th, 26 cases, and on the 17th, 14 cases were treated from the Saharunpore Dispensary.

The Mortuary Return of cholera cases, and the cholera map of Saharunpore, shew, at a glance, the progress of the disease in this district. The Natives state that, excepting those who were at Hurdwar, comparatively very few people have anywhere suffered from cholera in the Saharunpore District. In no single instance has a case of cholera been reported to me from any town or village out of the line of march of the pilgrims. The cholera cases which first occurred in the places marked on the cholera map were confined, as far as I can discover, to those who had been present at Hurdwar ;

Date of arrival of pilgrims and cholera at Saharunpore.

Cholera imported by the pilgrims and confined chiefly to those who had been at Hurdwar.

and in these places the pilgrims and the disease appeared, for the most part simultaneously.

It was on the 17th of April, that is, four days after the arrival of the pilgrims of Saharunpore, that cholera is known to have first attacked any individual in the town who had not been to Hurdwar.

On the fourth day (April 17th), after the arrival of the pilgrims, the Sub-Assistant Surgeon attended two cholera patients who had not been to Hurdwar, and on the fifth day (April 18th) two cases.

A chopper Hospital for cholera cases was erected outside the jail, and prisoners from Hurdwar were detained four days before they were admitted into the jail itself:

no case of cholera occurred in the jail.

From the Returns supplied to me through the Magistrate and the Police Office, together with the Mortuary Returns from the Hospitals, it appears that 1,265 fatal cases of cholera have occurred up to the 15th of May in the Saharunpore District.

No fresh admissions of cholera patients to the Hurdwar Hospital occurred after the 1st of May; it was free of cholera cases, and closed on the 12th of May. The last case admitted into the Saharunpore Cholera Hospital was on the — of May; it was free of cases and closed on the 14th of May.

From the reports that reached me, I am led to believe that the disease has now nearly ceased in the whole District of Saharunpore.

Having been called upon by the Sanitary Commissioners for Bengal to state what measures I would recommend with a view to prevent the spread of cholera in India, I beg to append the following

remarks :—

1. — Generally, it appears to me that the spread of cholera can be best prevented by a rigorous system of sanitation, which can be thoroughly effected only by the general diffusion, throughout the masses, both Euro-

Measures to prevent the spread of cholera.

Subsidence of the disease.

Mortality from cholera in the Saharunpore District.

Precautions at the Jail.

Stage of incubation.

pean and Native, of a knowledge of the Laws of Hygiene.

Though the idea of a perfect knowledge of, and complete obedience to, the fixed and unalterable laws of health; with eradication of disease as a consequence, is Utopian, we may yet reasonably expect that a practical application of the progressive Science of Hygiene will, by a process of exclusion, enable us eventually so to narrow the circumstances of cholera as to bring the disease completely within our understanding, if not entirely within our ability to cure.

2ndly.—As regards Fairs particularly. So far as local measures for the Fairs are concerned, I can suggest nothing better than the arrangements that were this year made for the pilgrims at Hurdwar. But assuming that these Fairs cannot be prevented, I would, with great respect, be allowed to suggest,—

1st.—That Natives should be prohibited from setting out for these Fairs from any place in which cholera, or small-pox, is known to be epidemic.

2ndly.—That through every District, lines of march, avoiding towns and cantonments, should be marked out for pilgrims, and that halting places, at proper distances from one another, should be selected. Each halting-place should be laid out as an encampment on the plan of the Hurdwar encampment of this year modified to suit the special circumstances of any particular case.

3rdly.—That in the event of an outbreak of an epidemic disease occurring at any halting-place, the people of the encampment should be detained, under medical treatment, in an isolated place, till the disease has ceased, and be then turned back by another road and sent to their homes.

4thly.—No individual affected with small-pox or cholera should be allowed to proceed forwards. He should be detained in hospital until cured, and be then sent back to his home.

5thly.—That railroads should form no exception to the rules. At each terminus, pilgrims' encampments might be laid out.

6thly.—For pilgrims returning from Hurdwar, similar arrangements to those before described should be made.

7thly.—It appeared that, amongst the pilgrims at Hurdwar this year, there were a great number of very wealthy people, and that, in point of fact, the proportion of actual paupers was very small; and I most respectfully submit that it would not be unreasonable to expect those who attend these Fairs to contribute to a Pilgrim's Fund, or in some way to provide, from amongst themselves, means for the adoption of such sanitary measures as may be thought necessary, not only to protect their own lives, but to prevent the lives of others being placed in danger.

In conclusion, I beg to point out that that portion of my Report which treats of the epidemic of cholera is necessarily incomplete, inasmuch as it is restricted to a brief notice of the disease in the Saharunpore District. To procure more information, or to attempt to trace the progress of cholera through Northern India, would necessitate, in the preparation of the Report, a very considerable delay, which, for many reasons, I am anxious to avoid.

My desire is to continue the history of the epidemic, and should the Government be pleased to direct such information as may be required for this purpose to be placed at my disposal, it would afford me much satisfaction so to endeavour to arrange the facts that may be supplied to me, as to be able to complete the history of the cholera epidemic of 1867, and to write a Supplementary Report in which the progress of the disease would be traced, and its chief features of interest commented on.

No. 23.—*Report on the Hurdwar Cholera of 1867*. By JOHN MURRAY, M. D., Inspector General of Hospitals, Upper Provinces.

(Communicated by Government.)

THE history of the Hurdwar Cholera of 1867 illustrates several of the most important characteristics of the disease, and determines, by an accumulation of evidence, certain vital points on which opinions differed.

The probability of the appearance of the disease had not been overlooked, and means were taken to ward it off. When it did appear, the best known available means of curing the sick pilgrims, and guarding the country through

which they passed, and the homes to which they returned were immediately brought into action. The experience here gained will be valuable in future, not only in India, but all over the world, in those countries where Cholera has established a footing, and from which there is no proof that its grasp has been loosened; and where its more frequent appearance, as in India, may be anticipated.

A mass of people, nearly as numerous as the population of Scotland, converging from the whole Hindoo world of Eastern Bengal, Southern India, and Western Punjab, was located on a bare plain on the banks of the Ganges on the 12th April. On that day they performed their allotted ceremonies and then dispersed, so that on the third day the place was again bare. The solid stream of pilgrims on foot, in hackeries, or on camels, which flowed along the road past Meerut (which is 80 miles distant from Hurdwar) for nearly a week, was like the crowd of a London street.

In ancient times the sacred bathing place was at the source of the Ganges, amongst the glaciers, near the summit of Budranah—one of the snowy peaks of the Himalayan Mountains. In modern days it has been transferred to Hurdwar, where the Ganges escapes from the mountains, and enters the level plains of Hindoostan. A sacred fair, or mela, is held there annually about the 12th of April; but every twelfth fair is held to be peculiarly sacred, and called "Koomb-ka-Mela." There was a story in circulation that this would be the last of the great Koomb Fairs, as Hurdwar had lost its sacred character, from the Ganges having been diverted into the Ganges Canal. Probably the Railway and Electric Telegraph, with the advance of intellectual education, will strengthen this idea during the next twelve years, and tend to its fulfilment; which is much to be desired; for, though the means which the present knowledge of sanitary science suggests, were freely used, and apparently with advantage, still the assemblage of such a mass of human beings, has been followed by great sickness and mortality from a disease which originated amongst themselves, and was disseminated by them, for hundreds of miles, causing the loss of many thousands of lives.

The encampment at Hurdwar, occupying about 25 square miles of bare, level, sandy ground, was regularly subdivided into streets and lanes, with shops, in which an ample supply of good food was provided, where the water was supplied

by the sacred Ganges, and where conservancy was provided for and carried out most strictly and effectually. The people lived in tents, or "in neat and picturesque-looking grass-huts." Commerce formed a powerful attraction for the meeting of Mussulmen, and a second object to the Hindoos. People began to assemble in the end of March, but the fair was not regularly open until the 3rd April; the crowd rapidly increased until the great bathing-day on the 12th at noon (when it is calculated to have reached nearly three millions), after which it suddenly dispersed. By the morning of the 15th, the entire ground, so lately covered with encampments, was a bare plain again.

The weather had been rather warm in the end of March; but there were several slight storms with rain, which rendered it pleasant, till the night of the 11th April, when there was a very severe thunderstorm, with heavy rain, which lasted all night, and up to noon of the 12th. There was a remarkable and sudden fall of the temperature on that day, amounting to 14 degrees, as shown in Table No. 1. The whole of the remainder of the month was unusually cloudy and rainy.

The health of the great crowd was remarkably good up to the 11th of April. This is proved by the evidence of the Medical, Civil, and Military Officers on duty, by the Hospital Returns, and by the evidence of the pilgrims, many of whom were questioned by myself on the road at Meerut. The testimony of all was that previous to the 12th, there had been no sickness; but that the Cholera appeared after the bathing (*nihana bad*), viz., noon on the 12th. There were several cases of Cholera that afternoon, and during the night; but only 8 were admitted into hospital next day. There may have been a casual case previous to this date, and four such were reported by the Police; but on inspection by the Medical Officer, they were not considered to be Cholera; and there was one slight case in a grass-cutter of the cavalry detachment, on the 9th. At the three hospitals, from the 3rd to the 13th of April, there were 1,352 patients treated, of whom 19 died; of these, two were from diarrhoea; but none from Cholera. There can be no reasonable doubt that Cholera was not present in an active form, on the 11th; and it is equally clearly proved that it did exist on the 13th; and that it contaminated and accompanied each and every one of the streams of returning pilgrims. Before

following its course from Hurdwar, it will be necessary to investigate its development or origin on the 12th.

In the North-Western Provinces, and the Punjab, Cholera has not been known to prevail during the cold season, or the earlier part of the hot season, except in *large crowds*, such as the *Magh Mela* at Allahabad, the Hurdwar Mela, and at the great Durbar at Agra last year. But in these the disease has had more of an endemic, than an epidemic character; the sufferers on their return, often dying in numbers on the road, without the residents of the places through which they passed, being materially affected. There is no record, or reason to suppose, that Cholera was prevailing at this unusual season, in any part of the Punjab, or the North-Western Provinces, with the exception of a belt of land skirting the Turagee, at the foot of the Himalaya Mountains. In February, Cholera was prevailing in the Turagee villages, in the vicinity of Nynoo Tal; and it extended, skirting the hills in a westerly direction, in March; and there were nineteen cases, from the 5th to 12th of April, in the village of Bazpore, which is 60 miles to the east of Hurdwar; and from this place doubtless pilgrims went to Hurdwar. Cholera was prevalent at Benares in March, and there were several cases in the Jail near Allahabad, on the 24th March, of an epidemic type. Returns from all the districts and stations in the North-Western Provinces and the Punjab, shew that previous to the 12th April, and till after the arrival of the Hurdwar Pilgrims, there was no epidemic Cholera present in them. Had the disease been imported from Bazpore, it would probably have first shewn itself in the Bijnore portion of the camp, on the left bank of the river, where the pilgrims from the Turagee were collected; but from the 3rd to the 13th April, only one case of diarrhoea, and no cholera was treated in the Bijnore camp, by Dr. Gardner. The simultaneous appearance of Cholera in every section of the pilgrims, who separated by various roads on the day the disease appeared at Hurdwar, indicates a more general, or atmospheric origin, than dissemination from an individual source. There is a remarkable coincidence between the thunderstorm and heavy fall of rain, on the night of the 11th, and morning of the 12th, and the appearance of the disease on the evening of the 12th. There was probably a connection between the two events; but the link that unites them, though now obscure, may yet be discovered. The severe attack of Cholera which appeared among the pilgrims at Mahadeo, in the Panch Murree Hills, in March 1865, was attri-

buted to "unseasonable showers." There was an analogous coincidence between a sudden fall of rain, and the appearance of Cholera, during the present year, in the vicinity of Agra. On the 29th May the female pupils of the Secundra Orphanage were drenched by a sudden storm of rain, when taking their usual walk. During that night, and the two following days, 31 out of 168 were attacked with Cholera, and 15 more during the following six days; after which no more cases appeared. The other pupils, consisting of 119 Christians, and 169 boys, were immediately removed, and no case occurred among them.

There are numerous instances on record of Cholera appearing amongst troops who have encamped on ground recently occupied by regiments who were suffering from Cholera. The disease has been observed to re-appear in the hospitals occupied the previous year by Cholera patients. In the six Cholera epidemics which have been under my management at Agra, it appeared about three weeks after the rains set in. The Orphanage at Secundra suffered during these epidemics, and Akbar's tomb in the vicinity was occupied by troops, or prisoners, on each occasion. In this instance of the orphans at Secundra, I consider that the seeds of Cholera were in the ground, and were developed by the rain.

There are records of severe epidemics of Cholera at Hurdwar, dating as far back as 1783, with more recent attacks in 1819, 1827, 1829, in 1855 and 1857; since which date there has been no attack till now—after an interval of ten years. Had there been Cholera at Hurdwar in 1866, I should have attributed the attack of the present year to the disease having been brought into activity by the rain, on the night of the 11th. The period during which it may lie dormant, till called into force by favorable circumstances, is not known.

I see no valid reason to question the probability of the seed of the disease, deposited on some previous occasion, having been brought into action by the rain, in the immense crowd collected during the present fair at Hurdwar. The stage of incubation of the disease varies from a few hours to three or four days. It only rarely exceeds the latter period.*

* Cholera appeared within three days of the arrival of the pilgrims in upwards of 70 per cent. of the villages, of which I have received reports on this point; but they are not complete.

As it appeared on the afternoon of the 12th, and as it was diffused over the whole crowd of pilgrims who departed on the 13th, the attack must have been of recent date, and of general application. The fall of rain, on the night of the 11th, was evidently the exciting cause, bringing into action the germs of the specific poison of cholera, for the growth of which the dense mass of shivering pilgrims formed a rich soil.

There may be uncertainty regarding the origin of this attack; but the nature and character of the disease, in its practical points, were clearly demonstrated during the return of the pilgrims to their homes. The pilgrims began to depart on the afternoon of the 12th, and radiated, as from a centre, all over the country.

The immense crowd had entirely dispersed by the morning of the 15th. They passed, at a favorable season of the year, through a healthy country where supplies were abundant, and where extensive arrangements had been made for their convenience. They travelled chiefly on foot, and slept in the open air, or under trees. Some had camels to carry their luggage, and there were a great many bullock-hackeries and bhylees, which carried families with their supplies. The ordinary rate of progress was from 15 to 20 miles a day. A few travelled quicker by the horse dawk carriages, and many continued their journey by rail, after reaching Gazeabad and Umritsur. The moving mass crowded the road in a continuous stream for nearly a week at Meerut, where I remained to watch the course of the disease. This pilgrim stream carried with it Cholera, which lined the road with victims, whose funeral pyres studded the surrounding fields, or whose bodies were thrown into the canal or collected by the Police and buried. The disease was communicated to the neighbouring towns and villages, and the pilgrims carried it with them to their homes, over the whole of Hindoostan.

There were cases of the disease, on the 13th April, at the first stage, on each of the four main lines of road, viz., 1st, at Bajwanpore, 23 miles from Hurdwar, on the way to Mooltan, to the west; 2nd, at Roorkee, 19 miles on the road to Hissar and Jeypore, to the south-west: as also on the 3rd line of road, *via* Meerut, to Allahabad, to the south; 4th, at Nujeebabad, 14 miles on the road, *via* Bijnore, skirting the Himalaya Mountains, towards Oudh, to the south-

east. Another Table, No. 2 shews the distance of the various stations from Hurdwar, and the date at which the disease was reported among the pilgrims, and the date at which it appeared among the residents. This Table is compiled from the reports of the Civil Surgeons of the chief stations, and from those of the Police Officers, for the districts and thannahs. There are returns from 597 districts and towns on the line of returning pilgrims, shewing 22,402 deaths from Cholera in the months of April, May and June. Perfect accuracy is not to be expected from all these sources. The mortality alone is recorded in the general Police reports; the number of cases and the date of attack is not recorded; and the interval between the arrival of the pilgrims, and the appearance of the disease among the residents, is only approximated from the fatal termination in both cases. The concurrence of so many independent witnesses to the fact, that the different villages and districts were free from the specific disease, Cholera, previous to the arrival of the pilgrims, and that the pilgrims brought the disease with them, from which they died after their arrival, and that their relations, friends, and neighbours were soon after attacked with Cholera and died; these facts can leave no doubt regarding the communicability of the disease, and the means—at any rate one of the means—by which it may be transmitted from one place to another. There are numerous illustrations in the reports of the manner in which the disease was transmitted to families on the arrival of relatives, to people of villages communicating with the pilgrims, to those who ate the food left by pilgrims, or travelled in the same carriage with pilgrims, and being afterwards affected by the disease.*

* The following extracts from the reports are interesting and valuable:—

1st.—From the report of W. E. Blyth, Esq., Deputy Commissioner, Montgomery, half-way between Lahore and Mooltan. "A pilgrim was taken ill of Cholera at noon on the 28th April, at a well in the village of Jhoogh Kullian (he died next day), and his soiled clothes were washed in an adjacent pond. Other parties who afterwards visited the well and the pond for water and ablution, caught the infection. The disease broke out on the 30th, and, up to the 15th May, 53 were attacked, of whom 27 died."

2nd.—From Dr. Gardener, Civil Surgeon, Bijnore. "At the village of Bisahat two men, who had returned from Hurdwar Fair, died of Cholera on the 30th of April, and their clothes were not burned according to orders given but were washed in a pond which was inside the village, the water of which was used for domestic purposes. On the 1st and 2nd May, in the same village, sixteen attacks occurred."

3rd.—From Major Mercer, Deputy Commissioner, Sealkote. "A pilgrim arrived at Wadala, suffering from Cholera. The *Hakem* who attended him lost his son and daughter from the infection, and the disease spread rapidly. Between the 7th and 14th May, 29 persons were attacked, of whom 6 died."

Many suffering from Cholera were carried forward in the hackeries, and even dead bodies were found so carried, when the hackeries were inspected before crossing the Sutledge at Roopur. The affected were also transported by Railway to Allahabad, and Mooltan, where the disease shewed itself on arrival. At the latter place it appeared at the terminus in a pilgrim on the 26th April, and in the town of Mooltan in a pilgrim on the 3rd of May; and on the 10th amongst the neighbours, gradually spreading in the city and extending over the district.

It is remarkable that Cholera has not raged at Mooltan since 1844, when the disease apparently came down the line of the Indus from Cabool. The long, arid, little frequented road between Lahore and Mooltan, probably guarded it from the Cholera which raged severely at Lahore in 1856 and 1861. The rapid communication by rail has now opened the way to the disease.

The disease was evidently communicated by the pilgrims to one another on the road, either in the hackeries, or by contact, or by consecutive parties occupying tainted ground; otherwise the disease would probably have died out before their distant homes were reached.

I did not expect that the residents in the North-Western Provinces and Punjab, would suffer severely at the time of the passage of the pilgrims, as April and May are not the usual months for Cholera to prevail in these parts of India; but I anticipated that it would prevail during the rainy season, which is the usual season for epidemic cholera. However, the disease appeared among the inhabitants on the arrival of the pilgrims all over the country, spreading extensively along the foot of the Himalayas, and extending far into the interior of the hills. It appeared amongst the European troops at Umballa and Peshawur. Again, on the south-west line,

4th.—From Dr. Williams, Civil Surgeon, Ferozepore. "On the 24th April the first case of Cholera occurred in the city in the person of Gunga Dass, who had not been to Hurdwar, but had returned from Jullundur, via Ludiana; on the evening of the 23rd in a dawk gharry in company with pilgrims."

5th.—From Captain Harris, Superintendent of Police at Umballa. "A party of pilgrims cooked and ate their dinner under some trees at a village near Roopur, on the 22nd April and continued their journey. Two sweepers from the village ate part of the food they left, and were attacked with Cholera 12 hours after eating it."

6th.—From Dr. Taylor, Civil Surgeon, Delhi. "One woman here has Cholera, being seized two hours after laying out a friend who had died of the epidemic."

towards Hissar, it spread generally, and proved very fatal. It has, as anticipated, re-appeared since the rains set in, in many of the stations in the North-Western Provinces, where it has attacked the European troops which escaped in April, as Meerut, Bareilly, Moradabad, Gwalior, and Lahore.

The disease had the usual symptoms of epidemic Cholera, with the variations which have come under my observation since I first saw it in Paris in the year 1831. Its appearance among the pilgrims is well described by Major Mercer, Assistant Commissioner, Sealkote,—

"1st.—Thirst;

"2nd.—A feeling of sinking in the stomach, and pain through the ribs on the region of the liver; (?)

"3rd.—The face then becomes anxious, and the eyes hollow.

Up to this stage the preventive (Cholera) pills have been found most efficacious, and when they were not procurable the disease has rapidly taken the usual form,—of purging and vomiting, cramps, and rapid collapse, terminating in death in a few hours."

Many thousands of these Cholera pills were distributed at the different camping grounds, and stations along the lines of pilgrims, and throughout the country, in the villages affected by the disease, and exhibited to the sick, with the favorable result mentioned.

This is not the place for a detailed account of the medical treatment of the various stages of the disease; but the precautionary measures adopted to secure the health and comfort of the pilgrims at Hurdwar, and on their return to their homes, and to protect the country through which they passed, may be mentioned in this description of the progress of the disease over India.

At Hurdwar, they consisted in securing good food and water, with free ventilation, in a regular encampment with convenient conservancy arrangements; the whole being kept in order by a most efficient Police force.

As the people arrived they took their places in a regularly-planned encampment, with straight broad roads. Ample stores of wholesome food and necessaries had been laid in; the Ganges water was near, besides there were several good wells. Latrines were constructed in convenient situations, and screened in; and an establishment of 700 sweepers

employed. The dry earth system of conservancy was used. Some of the Natives attributed the Cholera to this, that discharges continued moist under the covering of earth, instead of being dried in the sun, as formerly; and that the heavy rain penetrated this covering of earth, and caused the exhalation of noxious gases. This was the only part of the arrangements that was not highly praised by the pilgrims. In this instance, there was but a choice of evils, and that these were less under the new than under the old system, was proved by the absence of the intolerable stench previously complained of. It has been suggested that it might be an improvement to remove the night soil in carts. To extemporise such a conservancy establishment for an encampment containing two-thirds the population of London, would be difficult and rather expensive; and it could not be so effectual and free from annoyance, as what was used while the weather continued dry; and it is questionable if it would be more perfect during rain.

There were three hospitals established, chiefly intended for surgical cases and accidents. There was another hospital, in a detached enclosure, for contagious diseases as small-pox and cholera. Much good was done by dispensing medicine to the numerous troublesome ailments of the pilgrims; and relief from pain and comfort were given to a few worn-out and hopeless cases, before they died.

The arrangements for assisting the progress of the vast crowd of pestilent pilgrims through the country, and guarding its inhabitants from the disease they brought with them, were less complete: and it is doubtful if the instructions given were, in all instances, strictly attended to, or efficiently carried out.

The general outline of operations was, to prevent the pilgrims entering the towns they passed, and to supply them with food and medicine on the road; and to detain the sick in hospital until cured, keeping back one friend to attend; but allowing the party to proceed. The pilgrims, on arriving at their own towns, were, in some, placed in quarantine for a week; whilst, in others, the parties were detained only one day under inspection, and then allowed to enter the town, if well. On approaching cantonments or cities, the pilgrims were diverted from the main road, from three to five miles before it reached the city, and only allowed to rejoin

it some miles beyond. There was a cordon of Police along the line, and there were stringent military arrangements in all cantonments. A Cholera Hospital, with buncas's shops supplying food, was placed at the diverging point in the road, and all Cholera cases were there detained. Similar arrangements were made near some of the camping grounds. But many tainted must have passed unnoticed, particularly in the hackeries which were covered. Undoubtedly some pilgrims passed the cordon, and visited the cities for supplies, and there are reports of the inhabitants visiting the pilgrims, and being attacked with Cholera soon after returning. In only two stations were the European troops affected at the time the pilgrims passed, and Cholera appeared in only one jail; but there were few cities that were not affected. In general the numbers were small, and the disease did not prevail long. Still the extent of country is so great that I have received reports of upwards of 22,000 deaths from Cholera amongst the pilgrims and inhabitants. This number is doubtless far short of the truth. The comparative exemption of jails and military cantonments, suggests the general employment of the means there used, to keep out the disease, *viz.* strict seclusion, with scanty communication with the outer world. But is this stoppage of intercourse practicable in a thickly-populated country, with large commercial towns, and open unwall'd villages? Can it be expected that stronger measures than were adopted on this occasion, would meet with the cordial co-operation of a people, strongly imbued with the belief in *kismet*, or fate, like those of India? The means employed saved the lives of many of the pilgrims, and materially checked the spread of the disease among the inhabitants. Absolute immunity is unattainable; but by further development of the sanitary arrangements of the pilgrim camps along the roads, and in the towns generally over the country, the separation of the sick, and extension of medical arrangements, a further alleviation may be confidently looked for. These sanitary arrangements would involve considerable expense, which should be borne by those for whose benefit it is incurred. A sanitary tax might justly be imposed for this purpose, on all pilgrims visiting Hurdwar, or similar melas throughout the country.

No. 24.—*On the Disposal and Utilization of Sewage in Bombay.*

AT a meeting of the Government of Bombay in the Public Works Department, on the 13th September, the following papers were read on the disposal and utilization of sewage in Bombay :—

TO THE SECRETARY TO GOVERNMENT, P. W. D.

SIR,—In Mr. Krepp's book on the sewage question, a description is given of the method adopted at the Hague for collecting the night-soil of towns, and conveying it to arable land, to be at once ploughed in, and thus rendered available for the production of crops. We do not propose to repeat the description of the method, but simply to indicate how this process may be conveniently applied in Bombay. Between the islands of Salsette and Trombay, a large extent of ground has been more or less perfectly recovered from the sea, and only requires slight embankments, say 18 inches or two feet in height, to shut out the spring tides, and place it in a fit state to prepare it for cultivation. This area may be roughly estimated at 3,000 to 4,000 acres. It must be understood that, so far as this part of the project is concerned, Captain Liernur's method is not essential; it is no doubt an immense step in advance as to convenience and freedom from nuisance, but the present system would answer the purpose equally well, so far as to the mere collection of the sewage. But, instead of delivering the soil into the sea, or in the harbour, it will have to be filled into the casks described by Mr. Krepp, and forwarded by rail or by boat to the locality already mentioned, where on arrival, it should be at once ploughed in. If forwarded by rail, viz., by an extension of the Coorla siding already laid for the Municipality, there would be greater certainty in the transport, but also a marked increase in the cost. The Municipality now pay Rs. 6 per waggon for conveying sweepings to Coorla, and at this price would require 40 waggons to take out the quantity of soil daily collected, making the total cost Rs. 240 per diem, or Rs. 7,200 per mensem. But it could doubtless be done cheaper by sailing barges, which should be loaded ready to start from Bombay at 1 p. m. with the sea breeze, and return with the morning land wind with a load of empty casks. Eight barges, with the crews would cost about Rs. 200 each per mensem, or Rs. 1,600 per

month, and Rs. 800 for interest on outlay on repairs, would make Rs. 2,400 in all, or one-third of the cost by rail. Certain means and appliances would be required;—a pier and one ton steam crane at Bombay, and a pier and steam crane at the farm, to load and unload the barges. A tramway to transport the loaded casks to the vicinity of the land under plough, and bring back the empties. Workshops for repairs to casks, &c., would not be specially required, as these could be done in the shops already established. It is believed that no proprietary rights exist over the land which it is proposed to appropriate for this purpose, and that nothing more is requisite than the embankments already mentioned, with proper provision for drainage. The cultivation would at first be limited to the monsoon on account of the saltiness of the land, but as this improved under the washing of successive monsoons, cold weather crops of roots and cabbages would also be procured. Of course it would be idle to look for any profitable return until the salt had been sufficiently reduced in the soil to admit of growing the better kinds of grasses and roots; but as rice lands which have been reclaimed from the sea in Salsette and on the mainland, are known to be worth about Rs. 2,000 per acre, there can be no reasonable doubt that a fair return might be obtained on this system. Besides, even if it were not, and that the farms were worked at some pecuniary loss, the advantage of having wholesome food for cattle, and especially for the dairies in Bombay, is one that can hardly be measured by rupees, annas, and pies. The system may, however, be introduced without any great outlay, on the ground already in the occupation of the Municipality at Coorla, sending out the soil by rail as a temporary measure. Slight embankments would be required to shut out the spring tides; a few ploughs fitted up to carry to the casks, buffaloes might be hired to work them, and a sufficient number of casks procured to supply them with as much as they could plough in daily. It is probable that the result would shew such a good return as the ground improved in successive years, that the native cultivators would see the advantage of it, and endeavour to obtain a share of the supply for their own fields. The subject of preparing night-soil for exportation has not, it will be observed, been described, as it has been felt that an experiment of this kind should be carried on under the immediate superintendence of the persons most interested in its success, and the subject can very well be allowed to stand over,

until actual experience has proved for what crops in this country this measure is best adapted, and as the area of land which will be rendered available between Salsette and Trombay is large enough to exhaust the whole product of Bombay for many years to come, this is of no immediate importance, and may be left to be dealt with hereafter. There is every reason why Bombay should enjoy the first advantages of the experiment, which, if it succeeds, will materially lessen the cost of collection, and may and should prove a source of Municipal revenue. The establishment of cultivated land in lieu of a salt marsh will, it is believed, materially lessen the mortality from fever in Bombay, as Dr. Leith has repeatedly pointed out that the salt marshes between Trombay and the mainland, are one of the great causes of fever in this island. It may be objected that the employment of halalcors as cultivators of the farm will be fatal to its success; but it is believed that the Christian community in Salsette and Trombay will very speedily be willing to engage themselves as labourers, and even if they did not, the up-country halalcors are quite as good cultivators as their neighbours of higher caste. At all events, the utilization of the night-soil of Bombay, even if it does not prove as successful as is hoped, will initiate a movement in this direction which must sooner or later, as irrigation works extend, become a positive necessity.

A. DELISLE, Colonel, R. E.

T. G. HEWLETT, B. A., Surgeon.

BOMBAY, 15th August 1867.

TO THE SECRETARY TO GOVERNMENT, P. W. D.

SIR,—In obedience to the direction of His Excellency the Governor, I have the honour to submit the following observations on Captain Liernur's pneumatic sewage scheme, with reference to its adaptability to the requirements of the native town of Bombay. I quote the following extract from Mr. Krepp's work on the sewage question:—

"Small iron reservoirs are placed under the pavement of all principal street crossings, each reservoir being connected by means of small iron pipes, with the privies of the houses next to it, in such a manner that no offensive gases can escape; in other words, from every single privy a continuous air-tight passage leads into the next subterranean street reservoir, without the intervention of any cesspool. The pipes are provided each one with a valve to be worked from the

side walks of the street, so that the communication between each privy, and a street reservoir, can be established or cut off at will. These valves remain always hermetically closed, except during a short moment, when the privy contents are to be discharged into the street reservoir connected with it, which occurs during the night, in the following manner:—A loco-mobile steam-engine, working air-pump, is driven near the small subterranean street reservoir, to exhaust the air out of it, and out of the entire system of main branch pipes up to the hermetically closed house valves, which are then, one after the other, opened, and shut again, thus discharging the privy contents, including all gases into the street reservoirs. If the vacuum made in the reservoir and pipe system is complete or nearly so, the mechanical force of the atmosphere column rushing in, the moment a house valve is open, equals that of some thirty hurricanes. In order to maintain this vacuum, while a number of privy pipes are discharged one after the other, the air-pump standing near the reservoir is kept continually in motion, creating a constant draft, which causes all discharges to fly just into the reservoir and nowhere else, like so many shots from air-guns. The urine exceeding the solid fæces about eight or nine times in volume, affords sufficient moisture, not only to prevent the excrement from drying or caking, but also to keep the whole mass in so fluid a state, that removal is easy, unfailing, and complete, especially under the above-mentioned powerful blast operating upon it. All the privies and their pipes will thus be every day thoroughly cleaned of solids, fluids, and gases, and be filled with fresh air instead. After all the house valves have thus been successively opened and shut, an operation which practice has shewn can hardly be done quick enough, the small reservoir itself is emptied by pneumatic pressure, into a hermetically closed waggon reservoir, attached as a sort of tender to the air-pump carriage. This done, the connecting pipes by which the moveable apparatus communicates with the stationary one under the pavement, are uncoupled, and the loco-mobile with its tender proceeds to the next reservoir, and then to another and another, until the tender is filled. As the particular street where this will occur, can by practice be pretty accurately known beforehand, arrangements are made, that when arriving there, the loco-mobile meets an empty tender drawn by two horses, which changes place with the full one, thus allowing the sewage operation to go

on without interruption, the filled tenders being always drawn away by the horses to a temporary dépôt, where they are decanted by direct hydraulic pressure into air and water-tight barrels, which are then at once sent like any other goods by rail or steam-boat, to the lands requiring the excellent fertilizer thus collected."

Such is Captain Liernur's sewage system, which is now being carried out at the Hague and in other parts of the world, and I advocate its adoption in Bombay, for the following reasons:—

1st.—It provides for the complete removal of all night-soil and urine.

2nd.—This removal is completely effected a few hours after production, before decomposition has had time to set in, so that noxious gases cannot find their way into houses.

3rd.—During the process of removal, all danger of the soil and sub-soil waters being contaminated, is rendered impossible.

4th.—That this system is entirely independent of levels, and presents no difficulties either in construction, detail, or operation.

5th.—That the material which the experience of ages in China and Japan, has proved to be the best fertilizing agent for the production of crops for the use of man and beast is preserved, and that the great natural law of giving back to the land that which we have taken from her is capable of fulfilment.

That this scheme promises to realize the first two conditions, I think must be allowed by every one, and its adoption for the reason given in No. 3 alone would have the most marked influence on the health of this city. Pettenkofer, the greatest authority on cholera, has laid it down as an axiom, not to be denied, that cholera contagion is promulgated through the contamination of the sub-soil waters, and the impossibility of preventing this is one of the great objections, in a sanitary point of view, to masonry drainage. It may be objected that it does not do away with the fact that halalcoces will still have to be employed, and that manipulation is required to work it. I think this is one of its greatest advantages—a particular person will be responsible that each individual privy valve is opened nightly. If this has been neglected, detection and punish-

ment must follow on the succeeding morning. Halalcoces need not be employed at the privy valves, but I can, from an experience with this class, perhaps larger than any European has ever had before, bear testimony to their general intelligence, and express my opinion that they are perfectly competent to carry out every particle of detail required for the successful working of this scheme. It would be necessary, doubtless, at first to employ them as labourers in the sewage farm. I believe they are as good cultivators as their neighbours in up-country villages—at all events I am sure they would soon learn. I append a statement shewing the area in acres of that part of Bombay where the mass of the population reside. From it will be seen, that I propose that this system should be applied over an area of 1,917.59 acres, and to 15,123 houses in which 82,690 families, consisting of 632,745 persons, were residing at the time of the census. Mr. Krepp states that one reservoir of 20 cubic feet capacity will suffice for about 700 persons, and that one engine will empty 15 reservoirs, and that each engine requires 3 tenders.

Assuming the population to be 632,745 the sum would stand thus:—

$$\begin{array}{r} 632,745 \\ \hline 700 \end{array} = 904 \text{ reservoirs.}$$

$$\begin{array}{r} 904 \\ \hline 15 \end{array} = 60 \text{ engines.}$$

$$60 \times 3 = 180 \text{ tenders.}$$

Each tender is of 90 cubic feet capacity, and its contents are discharged into 18 barrels, each containing 5 cubic feet of soil; 3,240 barrels would therefore be required to receive the contents of the tenders. A much larger number would of course be required for contingencies. Mr. Krepp calculates one reservoir will suffice for 700 persons living in 60 houses, that is, an average of $11\frac{1}{2}$ persons to a house. From the figures above it will be seen that we have in this area an average of 41 persons and three-fourths to a house. It is impossible, without actual measurement, to estimate the lengths of street mains, and branch-pipes, that would be required; the branch-pipes would be laid under the present sweepers' passages. I have called for returns to shew the existing number of privies throughout this area, with the number of seats in each privy. I have already written to

Captain Liernur's agency unofficially, requesting the favour of being furnished with a rough estimate of the cost. I forwarded the area, population, &c., for him to form his estimate upon; but before any decided plan was fixed upon, there should be a regular survey of the town made, affording him every possible information. There is one great feature of this system which I would wish to draw particular attention to, viz., that if it is thought worthy of a trial, it can be introduced gradually into those sections of the town that stand most in need of improvement in this respect. Now there are in Bombay, as I have pointed out in a late report to the Municipal Commissioner, four districts which are entirely without drainage of any kind whatever. In Girgaum and its sub-divisions of Khetwaddy and Chowpattee, the population amounted, in 1864, to 50,866 persons. In this ward there are 345 privy cesspools, and 589 wells from which drinking water is drawn, 50 of which are within 25 feet of the privies. In Funnuswaddy there is no drainage. Caval is in the same state; it contains 125 cesspools and 86 wells. Mazagon has its 148 cesspools and 53 wells. And it is in these districts, as the mortuary returns for the last 18 years prove, that the ravages of cholera have always been most severe, and not, as a casual observer might have imagined, in the more thickly populated, but drier portions of the town; whereas in the market, each of the 135,661 persons living on its 152 acres at the time of the census, had but an area of five and four-tenths square yards—not in the native town proper, but in the suburban sections where the soil, the sub-soil, the drinking waters, are tainted with decomposing foecal matter so fatal to human life. In the 17 years ending December, 1865, the mortuary returns shew, that in the whole island of Bombay, there have died 40,285 persons from cholera, of whom 6,338 have died in Girgaum, Chowpattee, and Mazagon—being 15·73 per-cent. of the whole number of deaths. The population in the above-named districts being as 1 to 11 to the rest of the island.

I have not said anything about the utilization of the collected sewage, because I have already, with Colonel DeLisle, submitted a report on the subject, but I am very anxious that Bombay should take the lead in introducing the best system of dealing with this subject, on conservative principles.—I have, &c.

T. G. HEWLETT, Surgeon, Bombay Army,
Health Officer, City of Bombay.

Deaths from Cholera from 1849 to 1865.

Years.	Total No. of deaths from cholera in Bombay.	Total No. of deaths from cholera in Girgaum.	Total No. of deaths from cholera in Chowpattee.	Total No. of deaths from cholera in Mazagon.
Population according to Census	816,562	44,682	6,184	21,784
1849	2,269	168	69	73
1850	4,729	255	91	165
1851	4,020	229	84	145
1852	1,135	66	13	69
1853	1,339	110	16	60
1854	3,353	330	56	96
1855	1,739	154	41	124
1856	2,151	167	42	150
1857	1,741	141	52	67
1858	105	7	3	3
1859	2,265	209	66	108
1860	1,687	146	59	57
1861	1,251	198	15	40
1862	2,634	280	76	131
1863	2,742	336	26	178
1864	4,588	476	157	368
1865	2,537	223	58	85
Grand Total....	40,285	3,495	924	1,919
Total No. of deaths in Girgaum, Chowpattee, and Mazagon.....	6,338			
	Area of section in acres.	Number of families.	Number of persons.	Houses.
Market.....	84·32	5,793	75,402	1,080
Mandvee.....	78·49	6,302	41,152	851
Chuckla.....	48·15	6,622	41,442	934
Oomercarry.....	85·69	9,661	63,020	1,185
Dongree.....	67·86	6,796	60,259	721
Dhobie Talao.....	85·67	7,111	71,795	1,228
Funnuswaddy.....	78·37	3,411	24,529	547
Bholeswarr.....	71·86	7,649	50,282	1,069
Khara Talao.....	41·05	4,411	23,454	580
Koomberwarra.....	43·51	4,466	23,085	655
Girgaum.....	97·82	2,739	21,505	737
Khetwaddy.....	119·17	3,314	29,177	789
Chowpattee.....	84·91	1,067	6,184	441
Mazagon.....	267·48	2,749	21,784	735
Kamatteepoora.....	663·22	10,599	81,675	3,571
	1917·57	82,600	6,32,745	15,123

The system proposed appears to have many advantages over the ordinary plan of sewage drainage, the main difficulty to its introduction being, that it involves properly constructed house closets, a difficulty which is however equally applicable to the ordinary plan, and which no doubt will be overcome in time. Copies of these papers should be sent to the Municipal Commissioners for the city of Bombay, for communication to the Bench of Justices, who can obtain most valuable advice from their Health Officer. Should the Municipality find that they are financially able to adopt Captain Liernur's system, and thus use the refuse of the town in fertilizing the land, instead of polluting the harbour, the greatest possible benefit would be conferred on the community. Government will not object to make a grant of land on easy conditions for the establishment of an experimental farm, with the view of shewing practically to the cultivator the value of night-soil as manure; and the facility with which it is possible, under proper management, to apply it. Such a farm would at any rate be useful in supplementing a general system of drainage, and in reducing the cost of the greater system by being applied to those localities which present the greatest difficulties to any general system.—*Times of India. September 27.*

PART IV.

MEDICAL INTELLIGENCE.

(1.)

Further Orders regarding the Salaries of Medical Officers.*(From the Fort St. George Gazette, dated the 14th Jany. 1868.)*

RESOLUTION.—“The proposals of the Local Governments and Administrations differ somewhat.

The questions, however, of the salaries of Inspectors of Jails, which most of them raise, has been settled by the Secretary of State.*

* Financial Despatch, No. 261, dated 9th July 1867.

The Civil Surgeon's allowance for dispensaries is expressly merged in his new allowances.

The vaccination allowances are also settled by the General Order above quoted.”

The other appointments mentioned by the Local Governments and Administrations are—

Superintendents of Medical Colleges.

” of Central Jails.

” of District Jails.

” of Thuggee Jails.

” of Lock-ups.

” of Lunatic Asylums.

” of Botanical Gardens.

Medical charge of Colleges.

For these charges, the following allowances are sanctioned:—

I.—Superintendent } of a Medical { College or School.
or Principal }

When held by	Salary.
Assistant Surgeon.....	Rs. 800
Surgeon.....	1,050
Surgeon Major.....	1,250

When held as an additional charge, as at Agra and Nagpore.....Rupees 250

II.—Superintendent of Central Jails.

If the Jail be built for above 1,000 prisoners.	As a Civil Surgeon of the 1st Class.	} House free.
If the Jail be built for 1,000 prisoners, or under that number.	As a Civil Surgeon of the 2nd Class.	

The above to include *Medical* as well as administrative charge.

III.—Superintendent of a District Jail, always an additional charge, and including Medical charge.

Description of Jail.	Salaries.
	RS.
1st Class, containing 300 prisoners and upwards.....	150
2nd Class, containing less than 300 prisoners.....	100

IV.—Superintendent of Thuggee Jail and School of Industry.

1ST CLASS, JUBBULPORE.

If a sole charge, as a Second Class Civil Surgeon* If an additional charge, Rs.200. Second Class, Meerut and Lahore, additional.....Rs. 100.

V.—Superintendent of a Lock-up, constructed to contain not less than 50 prisoners, exclusive of prisoners under trial. As an additional chargeRupees 25.

VI.—Lunatic Asylums. Excluding those at Presidency Towns, which have been separately dealt with.

If a sole charge (in such case the number of patients to be not less than 200), as a Second Class Civil Surgeon (House free.)

If held as an additional charge, Rs. 250 if the Asylum is built for more than 100 patients; and Rs. 150 when for less than 100 patients.

VII.—Superintendent of a Botanical Garden. Botanical Gardens at Calcutta, as a 1st Class Civil Surgeon at other places, as 2nd Class Civil Surgeons. (House free.)

VIII.—Charge (Medical) of Colleges. This refers only to Colleges, or to endowed Colleges, managed by Government.

	RS.
If above 75 students.....	100
If under 75 do.	50

In the above classification some cases are not provided for as that of the Mitford Hospital at Dacca, or the King's Hospital at Lucknow. These Institutions, however, are managed by Government rather as Trustees, and should be the subject of private arrangement.

There are still a few cases omitted; but these will be separately considered as brought to notice.

The Calcutta Jails, now under Dr. Lynch, require special orders. He is an Uncovenanted Officer, but a future incumbent may not belong to that class. A Covenanted Officer appointed to the charge will be allowed, like all other Medical Staff Officers at the Presidency, house rent according to his relative Army rank, provided he is not furnished with free quarters.

Ordered that a copy of the above Resolution be forwarded

Government of Madras.	Chief Commissioner	to the Local
" Bombay.	of British Burmah.	Govern-
" Bengal.	Commissioner of My-	ments and
" the N. W. P.	sore.	Administra-
" the Punjab.	Resident at Hyder-	tions mar-
Chief Commissioner of Oude.	abad.	ginally not-
" of Central Provinces.		ed for information.

Copy also forwarded to the Military and Financial Departments, and to the Inspector General of Hospitals, Lower Provinces, for information.

(2.)—Orders of Government on the Annual Report upon Vaccination for 1866.

THE above report is printed in this volume, pp. 138 to 170.—It was on 25th March 1867 forwarded to Government by the Inspector General Indian Medical Department, with the following letter :—

TO THE HONOURABLE A. J. ARBUTHNOT,

*Chief Secretary to Government,
Public Department.*

SIR,—I have the honour to submit, herewith, Dr. Shortt's Report on the operations of the Vaccine Department of this Presidency, for the year 1866.

2. As Government are aware, the seasons of 1866 have been peculiarly unhealthy in many parts of the Presidency, and in addition to the ordinary difficulties of conducting their duties, the Superintendent and Vaccinators have had to pursue their operations in districts where the people have been stricken down by famine and pestilence. On the whole, and in consideration of all the difficulties in the way, it is satisfactory to find that so much work has been done.

3. The total number of 194,509 persons were vaccinated in 1866. In 1865 the numbers were 191,394, so that there has been a slight increase in the latter period.

The Mysore Vaccination Returns have been excluded from the totals of 1865 and 1866, which accounts in a great measure for the reduced numbers. Practically, it may be said that the reduced establishment has done more work than the old one, and that from the system of superintendence in vogue, the Returns of the last two years are the only ones that can be at all depended upon.

4. The proportion of successful cases has varied in the several districts from 93 to 80 per cent., and the average of the whole Presidency has been 86.38. Dr. Shortt has adopted the system of returning all doubtful cases, or children not seen after the performance of the operation, as unsuccessful. Under these circumstances, a percentage of 86 successful cases out of the 100 may be regarded as very satisfactory.

5. Government will notice with satisfaction that the number of Vaccinators employed by Zemindars, Municipal Associations, &c., has increased from thirty-one to forty-six.

6. Dr. Shortt's experiments on the propagation of the vaccine virus in the lower animals are interesting. By transmitting the small-pox virus through the cow, and using the lymph thus obtained, a new and energetic vaccine virus has been obtained for the use of the department.

The lymph in use in this Presidency appears to be exceedingly good.

7. The largest number of vaccine operations has been performed in the Coimbatore and Tanjore Circles. I am not quite satisfied that the maximum of work has been attained in the Madras, Cuddapah, Kistna, and Godavery Circles. In the town of Madras 4,627 is but a small number, compared with the yearly births amongst the population.

In the Northern Districts, the numbers are quite insignificant, when compared with the population. From Nellore up to Ganjam, inoculation for small-pox is still largely practised by the people. It will be seen from the Deputy Superintendent's report, that two of the staff of Vaccinators near Guntur were actually detected in the act of propagating small-pox by inoculation, instead of using the vaccine virus; so prejudiced are the people in favour of the former practice.

There can be no doubt that small-pox inoculation tends to the general diffusion of loathsome disease, and that when a sufficient staff of Vaccinators can be employed, the practice should be rendered illegal. On this point I may mention that a proposition to largely increase the staff of operators and superintendence is still before Government, awaiting sanction.

8. The reports of the several Superintendents shew clearly that their districts are too wide, and the number of Vaccinators too few to visit the whole area once a year. An increase in numbers, and a continuance of the present system of constant supervision, is absolutely necessary to ensure the spread of vaccination throughout the territories within the Madras Presidency.

9. Dr. Shortt recommends that Drs. Thompson and Pulney Andy may be permanently removed from the Vaccine Department, as they are not likely to return to duty in it. Dr. Thompson has proceeded to Europe to qualify for admission into the commissioned ranks of the department, and Dr. Pulney Andy has accepted permanent employment

under the Travancore Government. Under these circumstances there can be no objection to the course proposed.

10. The Vaccine Dépôt at Madras is stated to be in want of repairs. I trust Government may be pleased to direct the Public Works Department to do what is needed for the safety and preservation of the buildings.

11. The deficiency in the supplies of medicine issued to Deputy Superintendents will be rectified by departmental order.

12. In conclusion, I would desire to record my approval of the manner in which Dr. Shortt has conducted the duties of his department. He has been indefatigable in visiting the various circles, and in interesting local committees to employ Vaccinators of their own. The Deputy Superintendents, for the most part, appear to have laboured zealously also, in the face of many discouraging circumstances.

ORDER OF GOVERNMENT THEREON, 18th July 1867, No. 844.

With the foregoing letter the Inspector General Indian Medical Department submits the report of the General Superintendent of Vaccination, shewing the results of the operations of the Vaccine Department during the year 1866.

Notwithstanding the difficulties with which this Department had to contend during the season under review, owing to the unhealthiness of the year, the prevalence of famine, and the consequent increase of disease, the results of the past year are by no means unsatisfactory.

The total number of persons vaccinated was 194,509, exclusive of those whose names appear in the Mysore Returns; the number of persons vaccinated in 1865 was 191,394. The average proportion of successful cases throughout the Presidency was 86.38, a result which, considering the exceptional nature of the season, and the fact that all doubtful cases, and cases which are not watched after the operation, are returned as unsuccessful, must, as the Inspector General remarks, be considered very satisfactory.

These results are in great part owing to the exertions and good management of Dr. Shortt, who has, it appears, been generally ably assisted by his subordinates.

The Department, as re-organized two years ago, appears to work well, but it is urged that the districts are too large for the Deputy Superintendents to supervise thoroughly, and that the staff of Vaccinators is inadequate. These representations will be duly considered when orders are passed on the proposal for increasing the staff of Vaccinators and number of Superintendents.

The Government learn with pleasure that efforts have been made by various officers of Government, and independent gentlemen, to make widely known the advantages and the *modus operandi* of vaccine operations.

Dr. Shortt's experiments on the propagation of vaccine virus on the lower animals have led to valuable results: the remarks of the General Superintendent, with reference to the protective power which he believes vaccination may possess over cattle, and the benefits which may accrue from vaccinating cattle in villages where operations are going on, are especially worthy of consideration and experiment, both with a view to testing the results and propagating lymph.

It is gratifying to remark that the number of Vaccinators employed by Zemindars, Municipal Associations, and private individuals, is steadily increasing.

The Government concur in thinking that it is desirable to employ a few men of each caste, and to distribute them over the several circles, with a view to conciliating the prejudices, and meeting the wishes of the various classes of the community.

(Signed) R. S. ELLIS,
Acting Chief Secretary.

(3.)

Notification regarding the limits of Medical Districts at Madras and the Public duties of District Surgeons.

(From Fort Saint George Gazette, June 4th, 1867.)

1ST DISTRICT.

Limits.—All places lying north of the General Hospital, and of the northern esplanades, and situated within Municipal limits, are included in this District.

Dependent duties of District Surgeon.—Surgeon to Native Infirmary, Leper Hospital, and Black Town Dispensary; in medical charge of the Male and Female Civil Orphan Asylums, Debtor's Jail, and Foundling Hospital.

2ND DISTRICT.

Limits.—All places within Municipal limits, lying north of the Poonamallee Road, and west of Cochrane's Canal are included in this District.

Dependent duties of District Surgeon.—Surgeon to Vepery Dispensary and Female Orphan Asylum, and in medical charge of the Establishments of the Gun Powder and Gun Carriage Factories.

3RD DISTRICT.

Limits.—All places within Municipal limits, and lying between the Poonamallee and Mount Roads, are included in this District.

Dependent duties of District Surgeon.—Surgeon to the Penitentiary and Male Orphan Asylum.

4TH DISTRICT.

Limits.—All places within Municipal limits, south of the Mount Road and the houses south of the Adyar, are included in this District, on the understanding that, with the consent of His Excellency the Governor, the duty of affording medical attendance to public officers residing at the Club, the Club Chambers, and Pater's Gardens, shall be performed by the Surgeon to the Governor when resident in Madras. During the absence of the Surgeon to the Governor, this duty will devolve on the Surgeon of the 4th District.

Dependent duties of District Surgeon.—Surgeon to Tri-plicane Dispensary.

By order of His Excellency the Governor in Council.

(Signed) A. J. ARBUTHNOT,
Chief Secretary.

(4.)—Warrant Officers—Furlough Pay.

G. O. G. No. 76 of 22nd February 1867.—The following Extract from General Orders by the Government of India is re-published :—

Fort William, the 8th February 1867.

With reference to the General Order No. 551, dated 20th May 1862, the following paragraphs of a Military letter from the Right Hon'ble the Secretary of State for India, No. 267, dated the 7th December 1866, are published for general information :—

PARA. 3.—In the despatch to your Government, No. 149, dated 14th April 1862, it was stated that the privilege of drawing half Staff salary, together with their Military pay and allowances, while on Furlough to Europe on medical certificate for the period of six months, in accordance with the Rules which govern the absence of Commissioned Officers, would be extended to Non-Commissioned Officers, and Soldiers of every department.

4. This privilege should also apply to Warrant Officers, although they are not mentioned in the despatch referred to.—(G. O. G. No. 154 of 1867).

(5.)—Medical Department.—Circles of Superintendence.

G. O. G. No. 56 of 5th February 1867.—With reference to para. 8 of G. O. G. No. 901,*
* Madras G. O. G. 13th November 1866, No. 421. dated 26th October 1866, the Right Hon'ble the Governor in Council is pleased to notify that the Circles of Superintendence of the Administrative Staff of the Indian Medical Department of this Presidency, shall be as follow :—

1. Southern Division, with the addition of Malabar and Wynaad.
2. Mysore and Ceded Districts.
3. Hyderabad.
4. Nagpore.
5. Pegu.
6. Presidency and Northern District.

(6.)—Officers on Leave.—Pay Rules.

G. O. G. No. 59 of 8th February 1867.—The following Extract from General Orders by the Government of India is re-published :—

Fort William, the 23rd January 1867.

In modification of Government General Order No. 941* of 1861, His Excellency the Governor
 * Madras G. O. G. 1st General in Council is pleased to prescribe the following Rules, under which Officers may draw pay and allowances through their Agents in India when on leave beyond the limits of their own Presidencies :—

I. Officers proceeding on leave for any period under the old furlough rules, beyond the limits of their own Presidencies, will be permitted to draw their pay and allowances through their Agents, on the latter furnishing a satisfactory guarantee for the refund of over-payments.

II. The guarantee must be attached to the application of the Officer for permission to draw his pay in India, which must be submitted through the Pay Master, to be forwarded to the Controller of Military Accounts, who will grant the authority to the Agent to draw the pay monthly as it becomes due.

III. The guarantee is to be in the following form, and must bear a stamp according to the scale noted at the foot thereof, in order to cover any possible amount to be retrenched :—

Form of Guarantee to be furnished by Agents of Officers proceeding on leave beyond the limits of their own Presidency, to accompany applications of Officers to draw their pay and allowances in India during absence.

We Agents of do hereby engage, in the event of our being permitted to draw the pay and allowances of our constituent during his authorized absence from the Presidency, to repay such part of the amount as he may not be entitled to in case of death, as also such sums, with retrospective effect, as our constituent may become liable for, by his bringing himself upon furlough pay

from the date of quitting his own Presidency by any of the following acts :—

1. By overstaying the leave to sea for two years on medical certificate, or for six months on private affairs, which he may have obtained under the old furlough rules.

2. By proceeding to England from the leave aforesaid under the old furlough rules, without having returned to his own Presidency.

3. By proceeding on furlough from another Presidency, in which he has been staying on leave without previously returning to his own Presidency.

(Date.)	Stamp	Value of	(Signature.)
	When the aggregate Pay and Allowances of the Officer during the period of authorized absence amount to—	Stamp	
	from 2,000 to 5,000	Rs. 25	
	Do. „ 5,000 to 10,000	35	
	Do. „ 10,000 to 20,000	50	
	or other sum more or less as required by the Stamp Act.		

(7.)—European Detachments.—Doolies.

G. O. G. No. 42 of 25th January 1867.—The following Extract from General Orders by the Government of India, are re-published :—

The 8th January 1867.

With reference to chapter XIX, page 131 of the Medical Code, prescribing the complement of doolies for a Regiment of European Cavalry and Infantry, it is hereby notified that an additional doolie with bearers will be allowed for each Detachment consisting of not less than one Troop or Company when separated from Regimental Head Quarters.

2. When a Regiment is divided into Wings, one of the two doolies authorized will be attached to each Wing.—(G. O. G. G. No. 25 of 1867.)

(8.)—Assistant Surgeons in Medical Charges.

The following Military letter from the Right Hon'ble the Secretary of State for India, No. 266, dated 7th December 1866, is published for general information :—

MILITARY.

INDIA OFFICE :

No. 266.

LONDON, 7TH DECEMBER 1866.

*To His Excellency the Right Hon'ble the Governor
General of India in Council.*

Sir,—I have considered in Council your Military Letter No. 243, dated 21st September 1866, transmitting correspondence regarding the title of an Assistant Surgeon in Medical charge of a British Regiment or Brigade of Artillery during the absence of a Surgeon on "privilege leave" to the special remuneration of Rupees 150 per mensem laid down in paragraph 9* of Sir Charles Wood's Despatch, No. 152, dated 16th May 1864.

* Government General
Order No. 507 of 1864.

2. In reply I have to inform you that the special grant of Rupees 150 referred to, was sanctioned to Assistant Surgeons of Her Majesty's service in India who might, by the exigency of the service, be placed temporarily in medical charge of a British Regiment.

3. It should be allowed, therefore, in all cases of an Assistant Surgeon succeeding to the temporary charge on the death, removal, or absence on medical certificate of the Surgeon, but it was not intended that any such extra charge should be incurred as a consequence of the Regimental Surgeon being absent on private leave and for his own convenience.—(G. O. G. G. No. 288 of 1867.)

I have, &c.

(Signed) CRANBORNE.

(9.)—Punkahs and Tatties.—Family Quarters.

G. O. G. No. 165 of 16th April 1867.—Under the sanction

Fort Saint George.
Kamptee.
Secunderabad.
Trimulgherry.

Bellary.
The Mount.
Poonamallee.
Trichinopoly.

of the Government of India, the Right Honorable the Governor in Council is pleased to notify that Kuss-kuss tatties, Punkahs and

punkah-pullers, supplied at the expense of the State, to the Barracks of European Regiments and Batteries at the Stations noted in the margin, will also be supplied to the Family quarters at each of the said stations, for such period, during the hot season, as may be certified (by the Commanding Officer) to be necessary.

(10.)—Privilege Leave.

G. O. G. No. 171 of 20th April 1866.—The following Extracts from General Orders by the Government of India, are re-published :—

Fort William, the 4th April 1867.

With reference to Government General Order No. 403* of the 17th April 1865, and to previous orders on the same subject, His Excellency the Governor General in Council is pleased to notify that the indulgence of privilege leave

for sixty days consecutively, now granted to Officers generally, will be specially extended to ninety days in the case of Officers serving at the stations marginally named.

This cancels Government General Order No. 909* of the 29th October 1866.—(G. O. G. G. No. 365 of 1867.)

(11.)—British Medical Service.—Inspectors General.

With reference to Government General Order, No. 370 of this date, and to paragraphs 11 and 12 of Government General Order No. 901 of the 26th October 1866, the salaries of the Secretaries and Statistical Officers to the Inspectors General of the British Medical Service in the three Presidencies will be on the same scale as now laid down for similar appointments in the Indian Medical Service with reference to the rank prescribed.—(G. O. G. G. No. 371 of 1867.)

(12.)—Family Remittances.

G. O. G. No. 198 of 7th May 1867.—In assimilation with the practice in Bengal, the family remittances of Officers to

England should be regulated according to the official instead of the calendar year. This course should be observed from the commencement of the current official year.

2. The remittance for any one quarter may be made in the first month of the quarter; of the half year, in the fourth month of each half year; of the three quarters, in the 7th month of the year; or of the whole year, in the 10th month of the year.

3. Remittances of one official year must be completed during the year, and no portion of the authorized amount can be added to the remittances of the following official year.

(13).—British Medical Service—Administrative Circles.

G. O. G. No. 207 of 14th May 1867.—With reference to G. O. G. No. 901,* dated 26th October 1866, the following list of Stations comprised in each Circle of Administrative Superintendence of the British Medical Service for this Presidency, is published :—

CIRCLES.	STATIONS.
Presidency.....	Fort St. George and Stations adjacent, Trichinopoly and Wellington in the Southern Division, and any stations in the Northern District in which British Troops may hereafter be located.
Mysore.....	Bangalore, with the Stations in Malabar and the Ceded Districts.
Hyderabad.....	*Secunderabad and Trimulgherry, with Kamptee and other Stations occupied by British Troops composing the Nagpore Force.
British Burmah.....	Rangoon, with the two frontier posts of Thyetmyoo and and Tonghoo.

(14).—Medical Administrative Officers.—Designations.

G. O. G. No. 208 of 14th May 1867.—It is notified for general information and guidance, that the designations of the Administrative Officers of the British and Indian Medical Departments shall be as follows :—

INDIAN.	BRITISH.
Inspector Genl. Indian Medl. Department.	Inspr. Genl. British Medl. Service.
Deputy Inspector General Indian Medl. Dept.	Deputy Inspr. Genl. British Medical Service.

(15).—Embarkations, Invalids, &c., Clothing and Bedding.

G. G. O. No. 556* of 1865 is hereby cancelled.

The following articles will be placed by the Commissariat on board transports engaged for troops proceeding to England, *via* the Cape route, in charge of the Commander, to be issued on clearing the port of embarkation for the use of the troops during the voyage, and be accounted for by the Officer Commanding troops on board, to the Master of the vessel, at the conclusion of the voyage :—

Bedding.

1 Hammock.....	Per man, not being a 2nd class Passenger, or Staff Sergeant.
1 Mattress.....	For every man not being a 2nd class passenger, or Staff Sergeant.
1 Pillow... ..	For each woman, and child of above 5 years of age. One, instead of two English blankets will be issued for each child under 6 years of age.
2 English blankets.....	

Note.—The ship provides berths or bunks and bedding for 2nd class passengers and Staff Sergeants and berths or bunks for all women and children.

1 Sutturungee, or rug, for each child.

Note.—The last issued sutturungee belonging to the Indian bedding of the men and women is to be washed at the depôt or under regimental arrangement, and taken on board with the baggage for use during the voyage.

* Madras 16th June 1865, No. 229.

No other article of Indian bedding is to be allowed to be taken on board.

All serviceable hammocks, mattresses, and pillows, blankets and rugs, brought out from England by troops, after being carefully washed, are to be available for issue to troops returning to England.

Spare Bedding.

Framed sea cots, each with one mattress and one pillow.....	{	8 for every 100 invalids.
		3 for every 100 men, not invalids.
English blankets.....		5 for every 100 persons embarked.

Clothing necessities.

To be put on board by the Commissariat and delivered over to the Officer Commanding the detachment, to be issued to the troops on the ship going to sea:—

2 Canvas frocks.....	For each man embarked.
2 flannel bannians.....	{ For each invalid, in addition to the frock.
2 „ trousers.....	
2 pairs of socks.....	
8½ yards of flannel.....	{ For each woman and child.
2 pairs of socks.....	

Lists in duplicate of the bedding and necessities, showing the number and price of each article are to be sent on board with them,—one copy of each, to which the receipt of the Commander in the case of the bedding, and of the Commanding officer in the case of the necessities, is to be attached,—is to be sent by the Commissariat Officer to the Secretary to Government, to be attached to the articles of agreement, for transmission to England.---(G. O. G. G. No. 53 of 1867.)

(16.)—Medical Certificate to Europe.—Arrival and Departure at either Presidency.

G. O. G. No. 237 of 7th June 1867.—The following extracts from General Orders by the Government of India, are re-published:—

Simla, the 21st May 1867.

With reference to G. G. O. No. 190,* dated 20th Februar

* Madras G. O. G. 8th March 1867, No. 100.

1867, the following letter from the Right Hon'ble the Secretary of State for India, is published for general information:—

MILITARY.

No. 113.

INDIA OFFICE,

LONDON, 16TH APRIL 1867.

To His Excellency the Right Hon'ble the Governor General of India in Council.

Sir,—I have received and considered in Council your Military letter, dated 28th February 1867, No. 40, having reference to Lord Cranborne's Despatch No. 288 of the 24th December 1866, extending to all Officers of the Bengal and Madras Armies, holding permanent appointments situated above Allahabad and north of the Kistnah respectively, the rule which allows Regimental Officers whose corps are similarly situated to land at Bombay, and to enjoy, on reporting their arrival at that Presidency, the same advantages as they are entitled to on arrival at Calcutta or Madras; and suggesting for consideration further modifications of the existing rules affecting Officers proceeding to, or returning from, England on leave.

2. In consideration, mainly, of the improvement that has taken place in the facility for Officers to travel throughout India, your Government propose—

1st.—That the existing restrictive limit, as to the part of India whereat an Officer returning from England shall report his return to duty, be altogether removed, and that, “an Officer's return be considered to commence on the date of his report of arrival at whatever port he may, in good faith, disembark with that object.”

2nd.—That in order to place all Officers serving in India on a fair and equal footing, the present regulation may be so far modified, that Officers who may be absent on sick leave at other than their “own Presidencies, may proceed thence direct to Europe, if granted leave on medical certificate by the local Government, such leave being reckoned to commence from the date of embarkation, or that on which the pilot quits the vessel, as the case may be, according to the practice of the Presidency from which they embark.”

3. I approve of the existing rules being modified in the manner proposed by your Government in both the above cases:

the revised rule in the latter case being brought into operation from the date of publication of your General Order upon the subject, and made applicable to all Officers whose leave to Europe may be published in the *Gazette* upon a date subsequent to that order.—(G. O. G. G. No. 545 of 1867.)

I have, &c.,

(Signed) STAFFORD H. NORTHCOTE.

(17.)—Warrant Officers.—Wound Pension.

With the sanction of the Right Hon'ble the Secretary of State for India, His Excellency the Governor General of India in Council is pleased

Deputy Commissaries, Assistant and Deputy Assistant Commissaries, the pensions of their honorary or relative rank.

Conductors, Apothecaries and Hospital Stewards, £35 per annum (half a Lieutenant's pension).

Sub-Conductors, Assistant Apothecaries and Assistant Stewards, £25 per annum (half an Esquire's pension).

to notify the extension of the provisions of the Wound Pension Regulations to Officers of the Warrant grades, the scale of pensions admissible to the several grades being specified in the margin, and the admission to, and continuance of such pensions being regulated by the rules applicable to Commissioned Officers, as laid down in Articles 1 to 9, and 11 of the Regulations annexed to the Royal Warrant* of the 8th May 1861, published in G. O. G. G. No. 797 of 6th September following.

2. Wounded Warrant Officers who may be permitted to continue on the Effective Establishment, will be entitled to draw the Wound Pensions now sanctioned, in addition to the pay and allowances of their rank.—(G. O. G. G. No. 557 of 1867.)

(18.)—British Medical Service.—Returns.

G. O. G. G. No. 246 of 14th June 1867.—The Governor in Council directs that, from and after the 1st July 1867, all returns from British Medical Officers be forwarded, through the Deputy Inspectors General (British Service) of Circles to the Inspector General British Medical Service.

(19.)—Leave to Europe.—Advances.

G. O. G. G. No. 247 of 14th June 1867.—An instance having occurred of an Officer who proceeded to Europe on sick

* Vide Madras G. O. G. 30th August 1861, No. 291.

certificate, and who had drawn in India an advance of 3 months' Pay and Allowances, claiming from the India Office the remaining 3 months' Pay and Indian Allowances *in advance*, the Right Honorable the Governor in Council, under instructions from the Right Honorable the Secretary of State for India, notifies that the only advance of Pay and Allowances claimable, under regulation, by an Officer proceeding on leave to Europe is that authorized by the rule in para. 13, page 38 of the Pay Code, viz., Pay and Allowances for 3 months, from date of embarkation.

2. Payments in continuation are made in arrears whether in England or in India.

(20.)—Public Quarters.—Presidency Towns.

G. O. G. G. No. 250 of 14th June 1867.—The following Extracts from General Orders by the Government of India, are republished :—

Simla, the 28th May 1867.

In continuation of G. G. O. No. 856, dated 11th October

1866, * His Excellency the Governor General in Council is pleased to notify, under instructions from the

Right Honorable the Secretary of State for India, that whenever Staff Officers, for whom public quarters are not generally provided, and who, when stationed at Presidency Towns, are entitled to the superior or Presidency rate of house-rent, may occupy public quarters (which, when available, they should be required to do,) they are to forfeit Presidency house-rent in full payment of the rent of such quarters.—(G. O. G. G. No. 579 of 1867.)

(21.)—Lock Hospitals.

G. O. G. G. No. 253 of 18th June 1867.—With reference to the allowances for extra charges, item "Lock Hospitals," in G. O. G. G. No. 370, * it is hereby notified that the Lock Hospitals in this Presidency, have been classed as follows :—

1st Class.—Bangalore, Secunderabad, Kamptee.

2nd Class.—Bellary, Cannanore, Trichinopoly, Wellingdon, Saint Thomas' Mount.

* Madras G. O. G. 29th April 1867, No. 171.

(22.)—Returns.—Hospital Necessaries.—Surgical and Veterinary Instruments.

G. O. G. No. 268 of 25th June 1867.—The following General Order by the Government of India is republished, and its provisions declared applicable to this Presidency :—

Fort William, the 14th March 1867.

Half-yearly Returns of Surgical Instruments and Hospital Necessaries and of Veterinary Instruments attached to Batteries, Regiments and Hospitals as prescribed in Government General Order, No. 510 of 8th May 1866, are to be sent to the Office of the Examiner of Medical Accounts on the 1st April and 1st October of each year.

(23.)—Medical Department Rules.—Circles and Stations.

G. O. G. No. 269 of 25th June 1867.—The following Extract from a General Order by the Government of India is republished, and the rules contained therein are declared applicable to this Presidency :—

Simla, the 6th June 1867.

With reference to G. G. O. No. 901* of the 26th October 1866, His Excellency the Governor Madras, G. O. G. 13th November 1866, No. 421. General in Council is pleased to notify that the circles of Medical Superintendence attached to the British and Indian Medical Services will henceforth, or until further orders, comprise the stations detailed below :—

2. The Barrackpore, Benares, and Sealkote Circles are abolished, and the stations on the Arracan Coast are transferred to the Pegu Circle of Medical Superintendence.

3. The arrangements now notified will have effect from the dates on which the Deputy Inspectors General may assume charge of their respective circles.

4. With advertence to paragraphs 7 and 13 of the General Order of the 26th October 1866, the distribution of duties between the Deputy Inspectors General of the two services will be regulated as follows :—

I.—Duties strictly connected with the British Troops whether professional, economic, or sanitary, will be vested solely in the Administrative or Senior Officers of the British

Medical Service; and those connected with the Native Army, and bodies of men belonging to it in the Senior Medical Officers of the Indian Service.

No returns or reports connected with such duties, will consequently be required by Officers of one service from those of the other, excepting those referred to in Rule VIII below.

II.—The Senior Medical Officers of the two services on the spot, whatever their rank may be, will act as the Sanitary Officers and advisers of the Officer Commanding the station, in all matters relating to their respective departments, or duties as above indicated; and they will have the entire superintendence of the sanitation of the lines, bazaars, and establishments attached to them, of the regiments belonging to their respective services.

III.—Questions relating to the general health of the station as a whole, or those in regard to which there is any doubt as to the jurisdiction, should be considered and reported on by the Cantonment Board of Health, of which the Senior Medical Officers present of the two services, should be *ex-officio* members; or, if the question be a purely medical one, it may be considered by a Board of Medical Officers of both services, the senior presiding.

IV.—The President of any Medical Board, on Officers or Soldiers of either service *always*, if practicable,—and the members also of such Boards as far as can conveniently be arranged—should belong to that service.

V.—The arrangements for hospital servants for British Troops will be carried out by the Deputy Inspector General, or Senior Medical Officer British Service, in communication with the Commissariat Department, under the rules which have hitherto guided the Deputy Inspectors General of the Indian Army in similar matters.

VI.—The Subordinate Medical Department will be, as heretofore, under the control of the

* Hitherto designated
Principal Inspector General,
Medical Department.

Inspector General of Hospitals* Indian Service, Calcutta, who will at once transfer to the control of the

Inspector General of Hospitals British Service, all who are now employed with British Troops; and also place at his disposal, from time to time, such numbers of each grade as may be necessary to meet actual requirements,

including one or two to be available for emergencies in each circle.

VII.—When a Medical subordinate is nominated by the Inspector General Indian Service, Calcutta, for duty with British Troops, the Deputy Inspector General, or Senior Medical Officer British Service, of the Division or District in which the individual may be serving, should either himself or by a Board of Medical Officers, ascertain his fitness for the duties expected of him; and all Medical subordinates, when once placed at the disposal of the Medical Department of the British Service, will be entirely under the control of the Deputy Inspector General, or Senior Medical Officer of that Service in whose circle they may be serving. They will not be removed without previous reference to the Inspector General of Hospitals British Service, who should be at the same time informed how those removed will be replaced.

VIII.—Returns of all these Medical subordinates will be regularly rendered by the Deputy Inspectors General to the Inspector General of Hospitals Indian Service, Calcutta (as well as to the head of their own Department) and be accompanied by full information as to the conduct, merits, and professional capacity of each individual.

5. When troops are assembled for field service, all the medical arrangements for the formation of dépôt hospitals, the supply of medical stores, the transport of the sick, &c. &c., will rest with the Medical Officer of either service, who may be specially appointed principal medical officer to the force; but in other respects the spirit of all the foregoing orders will hold good.

6. Orders will be hereafter issued regarding the distribution of duties between the two Inspectors General of Hospitals of the Indian Service in this Presidency.

(24.)—Indian Medical Department.—Administrative Staff.

G. O. G. No. 297 of 12th July 1867.—The following Extracts from General Orders by the Government of India, are re-published :—

The 26th June 1867.

With reference to G. G. O. No. 456, dated 5th May 1865,

the following letter from the Right Hon'ble the Secretary of State for India, is published for general information :—

MILITARY.

No. 144.

INDIA OFFICE,

LONDON, THE 24TH MAY 1866.

To His Excellency the Right Hon'ble the Governor General of India in Council.

SIR,—Para. 1. In your Military letters, dated 8th and 23rd March last, Nos. 47 and 72, you submit for decision a question which you state has arisen with advertence to the order which allows officiating service "*on full pay*" in the rank of Deputy Inspector General of Hospitals," to reckon towards the additional pension granted to an Officer of that rank after five years' service therein, including only six months on medical certificate, whether the period of five years to which the tenure of that appointment, as well as that of Inspector General of Hospitals, is restricted should be inclusive or exclusive of such officiating service.

2. It appears to me that, if officiating service on full salary of appointment is to count towards the additional pension, it must necessarily count likewise as part of the five years' tenure of the appointment both of Inspector and Deputy Inspector General of Hospitals. The term of five years to which the appointment is limited, should I think be regulated as follows :—

It should include any period during which an Officer may have acted as Inspector or Deputy Inspector on full allowances before his permanent appointment. On his permanent appointment, his tenure would be held to expire at the end of five years, including the period of such officiating service, whether after his permanent appointment he may have taken leave of absence or not.

3. A Deputy Inspector General of Hospitals who may, under these circumstances, fail to complete the required service of the additional pension of £250 a year, may, if he shall subsequently be appointed Inspector General, and shall not serve long enough in that grade to entitle him to the pension of £350 a year, reckon his service as Inspector General in addition to that as Deputy Inspector General, towards the period required for the additional pension of the latter grade.

(25.)—Medical Officers.—Civil Salaries.

G. O. G. No. 382 of 10th September 1867.—The following Resolution of the Government of India, is published for general information :—

No. 1,909.

GOVERNMENT OF INDIA.—FINANCIAL
DEPARTMENT.

LEAVE AND ALLOWANCE.

Simla, the 9th August 1867.

Read the undermentioned papers :—

Notification No. 2294 issued from this Department on the 25th April 1867, publishing a General Order of the Military Department, No. 370 of the 4th idem, prescribing a scale of consolidated salaries for Medical Officers.

Letter from the Comptroller General of Accounts, No. 243, dated the 6th June 1867, suggesting, with reference to the above "that the pay of Civil Assistant Surgeons should, during transfer from one appointment to another, be charged to the Civil Department."

Letter from the Deputy Accountant General, Bengal, No. 753, dated the 27th June 1867, enquiring whether during the journey of a Medical Officer from one civil appointment to another his allowances should be treated as a civil charge and be limited to the amount of the unattached pay of his rank or be regulated by the salary attached to the station in which he last served.

Endorsement from the Military Department, No. 322, dated the 12th ultimo, forwarding a copy of correspondence regarding an enquiry whether the allowances of a Medical Officer in civil employ should be debited to the Civil or the Military Department during his absence on leave, or while he is in transit from one civil appointment to another.

Resolution.—The Governor General in Council observes that, under the orders of the 4th and 25th April 1867 mentioned above, the salaries of Military Medical Officers in medical charge of Civil Stations are consolidated, and is accordingly pleased to rule that, in common with Military and other Medical Officers in civil employ on consolidated salaries, they shall, during periods of transit from one civil appointment to another, which are to be limited by the civil rules for joining time, draw the salary of the lower paid

appointments of the two, and that such salary as well as the allowances admissible to these Officers during absence on leave, shall be disbursed in and charged to the Civil Department.

(26.)—Civil Surgeoncies.—Classification.

G. O. G. No. 418 of 1st October 1867.—The following Extracts from Notifications in the *Gazette of India*, are republished :—

Foreign Department, General, Simla, the 12th
September 1867.

With reference to the Military Departments' Notification, No. 370, dated 4th April last, publishing a revised scale of pay for the medical service, the Governor General in Council is pleased to sanction the following classification of the Civil Surgeoncies under the direct control of the Foreign Office :—

Civil Surgeoncies of the 1st Class.

Indore. | Rajpootana.

Civil Surgeoncies of the 2nd Class.

Hyderabad.		Meywar.		Jeypore.*
Nepal.		Marwar.		Bhurlpore.

His Excellency in Council is further pleased to declare that the remuneration, payable to Military Medical officers for the medical charge of the civil establishments at the undermentioned stations, shall be Rupees 100 per mensem :

Gwalior.		Nowgong.		Deolee		Bhopal* (Sehore)
				Bhopawur* (Sirdarpore.)		

The scale of salaries above-noted will come into effect from the date of this order, but present incumbents will have the option of retaining the old rates, if more beneficial than those now ordered.—(G. O. G. No. 1544 of 1867.)

* In this case, the order not to take effect during the present incumbent's term of Office.

(27.)—Privilege Leave.

G. O. G. No. 432 of 11th October 1867.—Under instructions from the Right Hon'ble the Secretary of State for India, it is hereby notified that the stations named in the margin

Thyetmyo.	Nusseerabad.
Tonghoo.	Aden.
Neemuch.	

are to be omitted from G. O. G. No. 365, dated 4th April 1867.

2. Henceforward the indulgence of privilege leave for ninety days consecutively is to be confined to officers of local corps, or of corps which, though liable to serve in any part of India, are usually employed in, or have their permanent head quarters at, one station or in one district, or division, such as the Punjab Frontier Force, or the 42nd, 43rd, and 44th Regiments Bengal Native Infantry.

3. Officers of such corps will, however, only be granted the extended privilege leave when serving at the remaining stations mentioned in the General Order above referred to, viz., stations in Assam, Shilong, Erinpoorah, Doolee, Khairwara, Khotra, Bunno, Dera Ismael Khan, Dera Ghazee Khan, Rajanpore, Jacobabad.

4. The restrictions under the foregoing order will not apply to any officers who may now be on privilege leave of absence under the provisions of the General Order of the 4th April last.

5. It is further ruled, for general information, that under the orders of the Right Hon'ble the Secretary of State for India, Military Officers cannot be permitted to visit Europe on privilege leave.—(G. O. G. No. 931-of 1867.)

(82.)—Presidency House-Rent.

G. O. G. No. 444 of the 18th October 1867.—The following extracts from General Orders by the Government of India, are republished:—

Simla, the 4th October 1867.

The following Resolution in the Financial Department, is published for general information—

Extract from the Proceedings of the Government of India in the Financial Department.—(No. 2,638, dated Simla, the 20th September 1867.)

Read the following correspondence:—

Letter No. 528, dated 20th June 1867, forwarding a copy of Proceedings of the Government of Fort Saint George, dated 14th June, in which it is ruled that the General Superintendent of Vaccination is entitled to retain, during absence on tour in the interior of the Presidency, the house-rent which is admissible to him at the Presidency under Financial Notification No. 2294, dated 25th April 1867.

Endorsement to the Military Department's No. 1553, dated 22nd July 1867, enquiring whether, under the rules of that department, house-rent would be continued in a similar case during temporary absence from the Presidency.

Military Department's reply No. 400, dated 23rd August 1867, stating that, under existing rule, Presidency house-rent is given to an officer whilst at the Presidency; but that as officers cannot give up and re-engage houses at short notice, it is expedient to continue the house-rent during temporary absence, unless the period of absence exceeds two months, exclusive of the months of departure and return.

RESOLUTION.—The Governor General in Council sanctions the modification of the existing rule which is proposed by the Military Department, but on the understanding that house-rent, under the modified rule, shall be continued only to those officers in receipt of the allowance, who may certify that their previous rate of expenditure for house at the Presidency continued during their temporary absence on duty.

2. The allowance of house-rent to the General Superintendent of Vaccination, Madras, should be regulated by this rule in future.

Ordered that a copy of this resolution be sent to the Home, Military, and Public Works Departments; the Comptroller General of Accounts; the several Accountants General, and to the Deputy Accountants General in independent charge.

(Signed) E. H. LUSHINGTON,

Secretary to the Government of India.

This Order is applicable to the three Presidencies.—(G. O. G. No. 957 of 1867.)

(29.)—Surgical Instruments.

G. O. G. No. 448 of 22nd October 1867.—In assimilation with the practice in Bengal, the Right Hon'ble the Governor

in Council directs that paragraph 6 of G. O. G. No. 379, dated 16th October 1866, be modified as follows:—

Para. 6. When Instruments are damaged or lost, a fixed rate of $\frac{1}{3}$ of their original value will be recovered from the Medical Officer responsible for their safe custody, except in cases where articles of silver, such as Probes or Caustic holders, which have an intrinsic value, have been lost, when their full value will be recovered, unless the injury or loss be explained (through the Inspecting Medical Officer) to the satisfaction of the Inspector General. When the losses are satisfactorily accounted for, the sanction of Government to the Instruments being written off the Returns must be obtained—cases of fair “wear and tear,” and petty deficiencies excepted.

(30.)—Rations, Medical Comforts, Water and Forage for Sea-going Ships.

G. O. G. No. 467 of 8th November 1867.—In supersession of G. G. O. No. 772* of 21st September 1864, G. G. O. No. 951† of 17th November 1866, and all previous orders, His Excellency the

Right Honorable the Governor General in Council, under instructions of Her Majesty's Secretary of State for India, is pleased to direct that the Scale of Rations, Medical Comforts, Water and Forage for Sea-going Ships, as laid down in the Regulations for Her Majesty's transport service, to be observed in respect of all ships employed by the Lords Commissioners of the Admiralty as transports or hired troop-ships, and as hereafter detailed, be made applicable to all English troops embarking for England, the Colonies, or proceeding from port to port in India.

1. An additional daily ration of $\frac{1}{2}$ oz. lime juice and $\frac{1}{4}$ oz. sugar (unrefined) for the first 20 days after leaving any Indian port, increased to 1 oz. lime juice and 1 oz. sugar from the 21st day to the end of the voyage, is allowed in addition to the Admiralty Scale.

2. In the case where salt meat issued for rations on board ship loses (from age or any other cause) one-half of its weight in the process of cooking, the Military Commanding officer is to appoint a board of three competent persons to investigate the circumstances, and if it should prove that

there has been neither carelessness nor ignorance evinced in the cooking of the meat, the master of the ship is authorized to supply an additional quantity of the same species equal to one-third of the original quantity or ration.

3. Porter is to be considered as beer or porter.

(31.)—Presidency House Rent.—Regimental Officers.

G. O. G., No. 453 of 25th October 1867.—The following decision of the Government of India will have effect in this Presidency, from the 27th September 1867, the date of its receipt:—

“A regimental officer who is not provided with quarters, and obliged by his duties to reside in a Presidency town, may receive special Presidency house-rent, but those who are in Military Cantonments, however closely contiguous these may be to the Presidency town, are not so entitled, as they have the advantages in respect of obtaining quarters which the Cantonment Rules secure to all Officers belonging to a military station.”

(32.)—Travelling.—Railways.

G. O. C. C., No. 13 of 5th February 1867.—The Commander-in-Chief is pleased to notify that Government have sanctioned the adoption in this Presidency of the following Bengal Rules* with certain additions thereto.

1. When British Commissioned Officers, Warrant Officers, and Non-Commissioned Officers in Staff employ, travel by rail at the Government expense, in course of relief, or on duty of a permanent nature, and are allowed to take their families with them, free passages will also be allowed for their wives and children, according to the rates of the Railway Company, as ruled in G. O., dated 13th February 1857, paragraph 13.

This rule applies equally to British Officers holding relative or honorary rank.

2. The wives and children of British and Native Soldiers are conveyed at the public expense.

3. Officers, Troops, and others entitled to conveyances at the public expense, are also entitled to transport at Government expense for their servants and followers, agree-

ably to the scale authorized for Inland service in G. G. O., No. 1129, dated 23rd December 1862.

4. Mounted Officers on duty will be entitled to conveyance at the public expense for the number of Chargers authorized to them, with their equipments and attendants.

5. The quantity of baggage for the several ranks to be conveyed at Government expense, exclusive of side arms for Officers, muskets or other arms, and accoutrements, in the case of Troops, is fixed as follows :—

	lbs. or Mds.	
General Officers.....	720 or 9	
Brigadiers.....	640 or 8	
Colonels.....	560 or 7	
Lieutenant-Colonels } Majors.....	480 or 6	Exclusive of the regulated amount of Camp Equipage of Officers on duty, which must be weighed separately and charged to Government under special sanction of Quarter Master General, or Station Staff Officer's countersignature.
Captains.....	400 or 5	
Subalterns.....	320 or 4	
Officers' wives, each...	320 or 4	
Officers' children above twelve years, each...	160 or 2	
Officers' children under twelve years, each...	80 or 1	
Medical and other Officers according to corresponding rank including Warrant Officers having Honorary Commissioned rank.		
Warrant and Native Commissioned Officers, Staff Sergeants, Native Doctors, European, Eurasian and Native Clerks.....	160 or 2	lbs. or Mds.
European Non-Commissioned Officers, Rank and File.....	80 or 1	
Wives of Warrant and Non-Commissioned Officers, Rank and File, Native Commissioned Officers, Native Doctors, European, Eurasian and Native Clerks, each.....	120 or 1½	
Children of do. do. each...	20 or 0½	
Native Non-Commissioned Officers, Rank and File, and authorized Public and Private Servants.....	40 or 0½	
Wives of do do each.....	40 or 0½	
Children of do do	20 or 0½	

	lbs. or Mds.
Officers' Mess.....	1,920 or 24
Sergeants' Mess.....	640 or 8
Soldiers' Regimental Library.....	640 or 8

N.B.—The quantity of baggage to be conveyed free of charge by the Railway Company is two tons or 54½ Bengal maunds for every 100 men as prescribed in paragraph 21 of G. O. dated 13th February 1867.

(33.)—Public Cattle.—Veterinary Surgeons.—Travelling Allowance.

G. O. C. C. No. 39 of 16th March 1867.—Under instructions from Government the Commander-in-Chief is pleased to republish the following General Order by His Excellency the Commander-in-Chief in India; and to notify that the Government of India have sanctioned an allowance being made to Veterinary Surgeons of 8 Annas a mile when travelling by dāk, of 3 Annas a mile when travelling by rail and of 5 Rupees a day during their stay at any out-station on duty in course of their inspection;—these sums being passed under the same conditions, as rule the grant in the case of District Inspectors of Musketry.

Head Quarters, Calcutta, 14th May 1867.

The Commander-in-Chief directs that the following rule, issued under instructions from Government, shall be entered in the Military Regulations as Article 1 A, Section XIII:—

Officers Commanding Stations will invariably comply with the requisitions of Executive Commissariat Officers for the services of Veterinary Surgeons to investigate the cause of any disease with which the public cattle may be affected, and to advise as to the best course to be adopted in cases of epidemic, among such cattle.

On such occasions the Veterinary Surgeon is not to be placed in charge of the public cattle, but is simply to be required to aid the Commissariat Department by giving his opinion as to the causes of the disease and the best mode of treating it.

(34.)—Inspecting Veterinary Surgeons.

G. O. C. C. No. 43 of 8th April 1867.—With reference to G. O. C. C. 16th March 1867, No. 39, it is notified that the travelling allowance therein sanctioned, applies only to inspecting Veterinary Surgeons.

(35.)—Travelling on Duty.—Refund of Railway Fares, &c.

G. O. C. C. No. 48 of 18th April 1867.—With reference to para 5 of G. O. G. No. 143, dated 15th April 1865, and G. O. C. C. No. 84, dated 10th July 1855, the Commander-in-Chief desires that officers and others, applying for the refund of Railway fares on submitting Bills for Travelling expenses, will invariably explain under what circumstances it became necessary for them to defray such charges themselves, instead of obtaining Railway Passes or Passage orders from the usual authorities. When the party has proceeded from a Military station, his application should be supported by a Certificate from the Officer of the Quarter Master General's Department at such station showing why public conveyance was not provided.

2. In any case in which the Commander-in-Chief may consider that the explanation is not satisfactory, His Excellency will decline to entertain the application.

(36.)—Gymnasia.

G. O. C. C. No. 46 of 17th April 1867.—The following Extracts from General Order by His Excellency the Commander-in-Chief in India, are re-published :—

Head Quarters, Calcutta, 14th March 1867.

No. 58.

With a view to the system of Military Gymnastics being carried out on a uniform plan, at all stations where temporary Regimental Gymnasia have been established, pending the construction by the Public Works Department of special buildings, the Commander-in-Chief directs that the regulations contained in Horse Guards' G. O. No. 864 of 27th March 1865, be carried out, as far as practicable, and the nature of the Gymnasium apparatus, locality and season will permit.

2. At the end of each quarter, a report will be made from each Regiment of Cavalry and Infantry in India, by the Instructor in charge, of the number of men attending Gymnastic classes, progress made, the condition of the apparatus and stores; noting any other points of interest, according to form D in the Appendix to Horse Guards G. O. No. 864; and on the relief of every class, a full return

of the measurements of the men who have completed the course will be furnished according to Form E.

These reports are to be sent through Officers Commanding Regiments to the Director of Gymnastics in India, at Simla, who will submit them to the Adjutant General, for the information of the Commander-in-Chief in India, and transmission to the Home Authorities.

3. Quarterly progress reports of Fencing, agreeably to the Form F in the appendix, are to be rendered to the Director of Gymnastics, at Simla, on the 1st January, 1st April, 1st July and 1st October in each year, by all Regiments of European Cavalry in India; likewise by Regiments of European Infantry in which Fencing is taught.

4. Batteries of Artillery, in which Gymnastic and Fencing classes are established, will also be required to furnish Quarterly progress reports.

5. Measurement Books and Forms, according to the Appendix of Horse Guards' No. 864, will be furnished on indent, free of cost, by the Military Presses of the several Presidencies as a temporary measure, and subject to future consideration at the end of one year.

6. Reports will be furnished at once according to the preceding instructions for the quarter ending 31st December 1866.

No. 62.

(37.)—Gymnasia Drill and Instruction.

The Commander-in-Chief is pleased to direct the republication of the following Horse Guards' Order, No. 895, of the 22nd October 1866 :—

"With reference to paragraph 8 of the Regulations for Military Gymnasia, published with General Order, No. 864, dated 27th March 1865, the Field Marshal Commanding-in-Chief desires that Running Drill be practised in all Infantry Regiments in conjunction with the ordinary drills, and that the following rules be observed in carrying out the practice.

"The men are to be exercised at the early morning, and at the afternoon drills; but the same men are only to run once in each day. All men over 15 years' service,—and weakly men, if considered unfit by the Medical Officer,—are to be excused.

"During the first fortnight the distance run is not to exceed 300 yards, for the second fortnight the distance may be increased to 600, and for the third fortnight to 900,—at the end of which time the practice is to be carried on daily at 1,000 yards, the men running on alternate days with arms and accoutrements.

"The pace is not to exceed six miles an hour.

"Care must be taken that the men are not exercised at the full distance of 1,000 yards, until they shall have gone through the six weeks' preliminary practice at the shorter distances.

"Where the ground will admit of it, the men are to run 15 or 20 abreast, in single rank; otherwise by Companies in 'Fours.'

"When a Regiment is sufficiently trained in the Running Practice, a certain number of movements are to be performed at each drill *at the double*, except when the men are in marching order."

2. With regard to the above General Order, the Commander-in-Chief in India, after consultation with the Inspector General of Hospitals, British Troops, is pleased to order that the Running Drill therein enjoined will be limited in the plains of India to morning parades, and further to what is called the Cold Season, viz., the interval between the 15th November and the 15th March.

3. Commanding Officers at Hill Stations will modify the order affecting the plains of India with due discretion, regard being had to the heat of the sun and the absence of flat parade grounds.

4. In India the gracious injunction of His Royal Highness Field Marshal Commander-in-Chief, that weakly men, if considered unfit by the Medical Officer, are to be excused these drills, requires the special attention of Commanding Officers and Medical Officers, more particularly at the commencement of the cold season, when many of the men have lately passed through the Hospitals owing to malarious disease.

Officers Commanding Regiments of British Cavalry and Infantry and Batteries of Artillery are directed to transmit to the Adjutant General, Fort Saint George, copies of the reports required by G. O. No. 58, for the information of the Commander-in-Chief.

(38.)—Dress—Patrol Jacket.

G. O. C. C. No. 65 of 31st May 1867.—With the sanction of Government, the following Horse Guards' G. O. is republished and made applicable to this Presidency—Officers will provide themselves with the Patrol Jacket described below—those in possession of the double-breasted blue frock coat are allowed until the 1st June 1868 to wear it out—after which date no other pattern but that of the Patrol Jacket will be permitted.

MARCH 1867.

No. 21—Dress of Officers.

1. Her Majesty the Queen having been pleased to approve of Officers of Infantry Regiments of the Line wearing a blue patrol jacket instead of the double breasted blue frock coat, His Royal Highness the Field Marshal Commanding-in-Chief, notifies the same for general information and guidance.

2. Field Officers will have their distinctive Badges embroidered in gold on the Collar.

3. The Sword Belt will be worn under the Patrol Jacket the Sash will not be worn in undress.

4.

5. A standard sealed pattern, of which the following is an accurate description, is deposited at the Horse Guards, and is to be strictly adhered to, and to assist Officers serving abroad, a sketch is also annexed (Appendix):—

PATROL JACKET.—Blue cloth, 28 inches long, measuring from the bottom of the collar for an Officer 5 feet 9 inches in height, with a variation of $\frac{1}{2}$ an inch longer or shorter for each inch of the difference in the height of the wearer, rounded off in front. One inch mohair braid all round and up open slits at sides. Four double drop loops with eyes in centre, of $\frac{1}{4}$ inch flat plait up the front: top loop, eight and a half inches and bottom loop six inches long. One row of knitted olivets, Austrian Knot, or sleeve seven inches from bottom of cuff to top of knot, Crow's toes of flat plait at top bottom of curved side seams, with two eyes at equal distances, lower eyes one inch apart. Hook and eye up front to neck. Stand-up collar with braid on top edge only. Pockets jetted with flap in and out.

(39.)—Travelling, Railway.—On Duty.

G. O. C. C. No. 70 of 6th June 1867.—The Commander-in-Chief directs it to be notified that the Governor in Council has been pleased to direct that, in assimilation with the practice observed in the other Presidencies, Officers travelling on duty at their own expense, or on mileage allowance, shall have the privilege of conveyance as 1st class passengers at 2nd class rates.

2. Station Masters have received instructions to grant this privilege to the Officers in question, on the production of a copy of a memorandum in the annexed form, which should be obtained from Staff Officers who are at present authorized to issue Railway passes.

3. If an Officer during his journey has to travel by different Railways, he should take care to provide himself with a sufficient number of copies of the Order.

FORM.

To the Traffic Manager, Madras Railway.

The undermentioned Officer is proceeding on duty from _____ to _____ at his own expense, and is entitled under G. O. C. C. dated _____ to travel 1st class at 2nd class fare.

By order,

(Signed) A. B. _____

(40.)—Passages—Leave.

G. O. C. C. No. 89 of 26th July 1867.—The following Extracts from General Orders by His Excellency the Commander in Chief in India, are republished :—

Head Quarters, Simla, the 29th June 1866.

No. 144.

With reference to the extract from the Secretary of State's

"It therefore appears to me desirable that only in those special cases where the Overland route is expressly sanctioned by a Medical Board, or the exigencies of the service require it, should the higher or steam rate of passage be granted. In all other cases of Officers entitled to passage, the sailing allowance only should be granted.

Despatch, marginally quoted, received with Military Department, No. 329 of the 8th April last, the Commander-in-Chief is pleased to direct that the route by which an Officer of the British Army is to proceed home

is to be decided on professional grounds by the Medical Board, before which he appears, and that the fact of its having been so, is to be invariably specified in the report of their proceedings.

This order is applicable to the three Presidencies.

(41.)—Leave—Medical Board—Out-stations.

G. O. C. C. No. 96 of 12th August 1867.—With reference to the system hitherto obtaining for the Invaliding of Officers of the British Service at Out-stations, such as Kamptee and Cannanore, where they could not conveniently appear before Boards under the Presidentship of the Principal Medical Officers British Troops, the Commander-in-Chief directs that under the altered circumstances of the two Medical Services when it is no longer the duty of the Senior Officer of the Indian Medical Department to preside at such Boards at out-stations, all Officers appearing before Boards presided over by Medical Officers under the rank of Surgeon Major, should appear again at the port of embarkation before the usual Board of British Medical Officers, also that it will be competent for the Senior Medical Officer of the Station, or where there is only one, the Medical Officer of the Station, to grant an emergent certificate in urgent cases of sick Officers, so as to allow them to leave the station at once, either to embark for England or to go to the Hills, as the case may be, with the permission of the Commanding Officer, in anticipation of the sanction of His Excellency the Commander-in-Chief.

(42.)—Travelling on Duty.—Railway.

G. O. C. C. No. 98 of 15th August 1867.—With reference to the latter part of para. 3 of G. O. C. C. dated 5th February 1867, No. 13, the Commander-in-Chief directs it to be notified in Orders that Clause XIV of para. 3 of G. O. C. C. No. 8, dated 22nd January 1866, is cancelled: and that Officers and others travelling by Rail at the public expense will hereafter be entitled to transport at Government expense for their servants and followers, agreeably to the following scale :—

	<i>Servants and Followers.</i>
Commander-in-Chief or Commander of a Corps d' Armée.....	Unlimited.
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(43.)—Hospitals.—Inspections.—Invalids.

G. O. C. C. No. 80 of 3rd July 1867.—With reference to G. G. O. No. 901, dated 26th October 1866, republished in G. O. G. No. 421, dated 13th November 1866, defining the Circles of Administrative Superintendence of Her Majesty's British Medical Service, the Commander-in-Chief is pleased to issue the following instructions for the Inspection of Hospitals of Her Majesty's British Regiments and Depôts, and for the assembly of Medical Boards for the examination of the Invalids of the season.

I. Administrative Officers will inspect Hospitals in their Circles as follows:—

At Head Quarters and at the near Stations of their respective Circles twice a year, viz.,—The first inspection will take place in June or July, and the second at a period approaching the end of the year to be fixed according to circumstances, by the Inspector General.

The inspection of out-stations will take place once a year or oftener, if considered necessary by the Inspector General.

For the present the inspections at Tonghoo and Thayet-myo will be held once in each alternate year in consequence of the difficulties of communication.

II. Medical Boards on Invalids, (at which Administrative Officers are to preside) will assemble annually under the orders of officers Commanding Divisions and Forces, and their Proceedings are to be considered final.

III. These Boards are to be held at the Head Quarters of Circles, and at out-stations at such time as may be decided upon in communication with the Military Authorities, as most convenient to admit of the Invalids and Time-expired men reaching Bombay or such port of embarkation as may hereafter be determined immediately before the time fixed for the sailing of the Steamers by the overland route.

IV. All men recommended to be sent to England, are to remain at their respective stations, until they receive orders

to proceed to the port of embarkation, with the exception of those at Bellary, Saint Thomas' Mount, and in Burmah.

V. Men at Bellary recommended to be sent to England, will proceed to Bangalore and be attached to a Regiment of their own branch of the service, until ordered to the port of embarkation with the Invalids, &c. of that station.

VI. Men serving at Saint Thomas' Mount will be sent to the Dépôt, Poonamallee.

VII. Men serving at out-stations in Burmah, will be sent to Rangoon to appear before the final Medical Board at that station from whence all Invalids from Burmah will be sent to the Dépôt, Poonamallee, to await their final orders for embarkation.

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