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"TRACHOMA: A Historical and Clinical Study."

A Thesis

presented to the Faculty of Medicine
of the University of Edinburgh

by

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THE EARLY HISTORY OF TRACHOMA.

Trachoma was well known to the physicians of ancient times. As Hourmon^uziadès remarks, "L'histoire du trachome ou conjonctivite granuleuse remonte à la plus haute antiquité." (p. 18)

"Trachoma" as a term to designate the rough or granular condition of the inner surface of the eyelids is first met with in Pedanius Dioscorides, a writer of the first century of the Christian Era. Galen, who lived a hundred years later, mentions a number of remedies for the condition, which he terms *τραχυσματικῶν*. In the earlier Greek writings the more general designation Ophthalmia is alone used. Amongst the Latins the terms in common use are aspritudo and lippitudo, indicating respectively roughness of the lids and blar-eyed-ness. Celsus, who flourished in the first century A.D., gives an accurate description of the course of the disease in the following words:- "Haec autem (aspritudo) inflammationem oculorum fere sequitur, interdum major, interdum levior. Nonnunquam etiam ex aspritudine lippitudo fit: ipsa deinde aspritudinem auget, fitque ea in alius^u brevis, in alius^u longa, et quae vix unquam finiatur." He recognised the progressive changes in the granulations, and subdivided them according to the degree of their evolution into various stages, the last being that of Sycosis, i.e.

hypertrophied grape-like masses.

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The disease, then, as a distinct pathological entity, was recognised in early times. It has also been claimed for the ancient physicians that they appreciated its contagious character. It is true that references are found in classical and post-classical writers, such as Aristotle, Plato, Plutarch, Ovid, and Seneca, to the "catching" nature of Ophthalmia; but these references on closer examination hardly bear out the contention, indicating rather a belief in "sympathy" than in what is known in modern times as infection.

Perhaps the most interesting point that emerges in the study of Trachoma in ancient times is the fact that, as far back as the age of the Father of Medicine, mechanical and surgical methods of treatment were in vogue.

Pursuing the subject into a later period, we find that the Arabian physicians, to whom passed the scientific study of disease after the decay of the Greek and Roman Empires, "confused and obscured" the knowledge of Trachoma by identifying it with Psorophthalmia or lid-itch. This bad tradition was carried on into the Middle Ages by the European writers who followed the teaching of Rhazes, Avicenna, and other Arabs. "They have described Trachoma so vaguely that we can only make a conjecture as to its occurrence in Southern and Central Europe at that time." (Boldt p. 7.) All knowledge of the disease did not, however, die out;

and from time to time recognisable descriptions of the granular condition of the lids are found in various writers, a number of whom recommend mechanical methods of treatment.

In the 18th century several epidemics of Ophthalmia were recorded, especially amongst troops on the Continent of Europe; and also one described by James Ware in Berkshire in 1778. The exact nature of these epidemics it is now impossible to ascertain. They do not seem to have attracted much attention, and we find that when epidemic ophthalmia burst upon the countries of Northern Europe in the early years of the 19th century, it came as a new and unknown scourge. John Vetch, writing in 1807, remarks that "the novelty with which it now appears to everyone when he first meets with it in practice is undiminished."

II. "THE EGYPTIAN OPHTHALMIA."

The modern history of Trachoma in Europe dates from the time of the Napoleonic campaigns in Egypt. The English and French troops engaged suffered severely from an epidemic form of eye disease, which on their return they disseminated, not only in the garrison towns in which they were quartered, but also through the civil population of their native countries. The name commonly applied to it at the time, "the Egyptian Ophthalmia," sufficiently indicates its origin.

Turning then to that country, we find that though Trachoma, or at least some form of Ophthalmia, "even in ancient times was a common and familiar disease, not only in Hellas proper and the Coasts of Asia Minor, Sicily and Lower Italy, but also in the Hellenic Empire of the Roman Emperors, which embraced the countries bordering on the Mediterranean Sea" (Boldt, p. 7), Egypt itself could claim no notoriety in this respect. The travellers and geographers of every century down to the Middle Ages unite in praising the salubrity of its climate and the high state of civilisation and well-being enjoyed by its inhabitants. Greek and Roman writers are alike silent as to any prevalent or serious eye disease in Egypt. Neither Alexander's nor Caesar's armies in their campaigns appear to have suffered from Ophthalmia. The records of the Crusades make no mention of it. "In the memorable French expedition

against Egypt under the celebrated St. Louis, in the year 1249, among the various diseases which harassed that gallant army, Ophthalmia is not included in the number". (Edmonston's Treatise p. 65).

From the 15th Century onwards, however, a change creeps over the scene. One writer after another speaks of the widespread suffering and blindness caused by Ophthalmia, till at last in the 18th Century books of travel, no feature is more markedly emphasised.

Though we have not, perhaps, the data necessary to afford a full and satisfactory explanation of this phenomenon, still the knowledge we possess of the history of the land and its people, points more or less definitely in one direction, and suggests the close connection of the disease with political, social and hygienic conditions.

In ancient times Egypt was an independent and highly cultivated country, and its inhabitants lived in the enjoyment of the blessings of peace and prosperity. Towards the end of the 4th century A.D., in the time of the Byzantines, a retrograde movement began, which was accelerated under the sway of the Mamelukes and culminated in the subjugation of the country by the Turks in 1517. "It then became a distant Province of an arbitrary government. Subjected to the rapacity of ignorant rulers, who had little interest

in its prosperity, and whose only view was to enrich themselves during their precarious sovereignty, it became the constant scene of plunder and revolt. Agriculture and the arts of peace became matters of secondary consideration. The fertilising canals which traversed its plains were practically choked up; the ditches which drained the soil, and opposed a barrier to the sands of the desert, were soon obliterated; and the fields which had once been clothed in the richest verdure were converted into sandy wastes. It is perhaps impossible to ascertain, with any degree of precision, the period when Ophthalmia became so widely prevalent in Egypt; but it is highly probable that its occurrence was in some measure connected with the final subjugation of that country by the Turks."

Such is Edmonston's conclusion and with him Boldt agrees. Hourmon^uziadès, on the other hand, thinks that Egypt and North Africa must, from ancient times, have been the cradle of the disease and that the absence of early records is due to the destruction of the Alexandrian library. "Cette région", he remarks, "à cause de ses conditions climatiques, a dû être vraisemblablement le berceau du trachome, qui porte encore le nom d'ophtalmie d'Égypte, son pays de prédilection". (p. 18).

The first account of Egyptian Ophthalmia by a scientific observer came from the pen of Prosper

Alpinus, a Venetian physician who practised in Cairo towards the end of the 16th century. He gives a full description of the climate and seasons of the country, including a detailed consideration of the khamsin, the hot wind which blows fitfully and tempestuously from the desert during "the first summer", as he terms it, the period from March to May. He ascribes to it many diseases: "illo que etiam tempore qua plurimos vagasse epidemicos, atque lethales morbos, maximeque oculorum lippitudines, quas Graeci ophthalmias appellant". He notes that in Cairo this "lippitudo" is prevalent even in the winter months, and indeed all the year round: "hyeme oculorum lippitudines ibi multae vagantur: plurimas que Cayri easdem per omnia anni tempora homines invadere ob nitrosam pulverem, qui continue oculos habitantum, mordicat et calefacit, observatur".

In this explanation he is followed by several subsequent writers, e.g. Savary and Sonnini. The former of these ("an elegant and learned traveller") carries the theory further by remarking - "L'usage où sont les Égyptiens de dormir en plein air pendant l'été, ou sur les terrasses de leurs maisons, ou près de leurs cabanes, est sans doute l'origine de cette infirmité. Le nitre, universellement répandu dans l'air, les rosées abondantes des nuits, attaquent l'organe délicat de la vue, et les rendent borgnes ou aveugles". (Edmonston p. 77).

Coming down, however, to a period nearer to that with which we are chiefly concerned we find in the travels of Volney, who spent from 1783 to 1785 in Egypt and Syria, a special section devoted to Blindness in Egypt, in which, while attributing part of it to smallpox, he discusses at length the Ophthalmia so common in the country. "Out of a hundred persons I have met," he says, "while walking in the streets of Cairo, twenty have been quite blind, ten wanting an eye, and twenty others have had their eyes red, purulent or blemished. Almost everyone wears a fillet, a token of an approaching or convalescent ophthalmia." (p. 240). He notes the special prevalence of the disease in Cairo, which, he adds, "is always full of filth", and draws attention to the fact that "the common people are more liable to them than persons in easy circumstances. . . and the peasants of the Delta are more subject to them than the Bedouin Arabs. These defluxions happen at no certain season, notwithstanding what is said by Prosper Alpinus. They are an endemic disorder, common to every month of the year and to every age". (p. 242). In discussing causes, he thinks that sleeping out of doors is not sufficient, for the Bedouin are not affected to any great degree. The air must be possessed of "some noxious quality", "and this quality doubtless is moisture combined with heat, which then becomes a first principle of these disorders". Hence the disease is

commonly seen in the Delta and by the sea coasts in Syria, though in the latter country the inland areas are free from its attack. Another important cause he finds in the poor diet of the common people, particularly raw onions: "bodies thus nourished abound in corrupted humours, which are constantly endeavouring a discharge. They, therefore, naturally attack the head because the Egyptians by shaving it once a week and covering it with a prodigiously hot head-dress principally attract to that the perspiration; and if the head receives ever so slight an impression of cold on being uncovered, this perspiration is suppressed, and falls upon the teeth, or still more readily on the eyes, as being the tenderest part". (p. 434).

Thus far, then, we have traced the rise in Egypt of an endemic, and apparently finally pandemic, form of Ophthalmia, and have reviewed the theories promulgated by various observers as to its etiology. We turn now to a study of the transference of that disease in an epidemic form to the armies of England and France, and its dissemination through them into other countries.

Napoleon landed in Egypt on July 1st, 1798 with an army of 35,000 men. Within three weeks his troops were attacked by foes more deadly and more obstinate than those they had already faced and overthrown on the battle-field. Plague, dysentery, scurvy and sun-stroke accounted for more deaths, "but Trachoma, the

Egyptian Ophthalmia, was especially fatal to their efficiency as a fighting force" (Boldt p. 9). The disease spread with extraordinary rapidity through the army, and several special ophthalmic hospitals had to be erected, through which thousands of patients were passed. Though much of the disease appears to have been of a mild character, and the French Surgeons, as we shall see, claimed remarkable success in their treatment of it, it is unquestionable that much permanent loss of sight resulted. Exact figures are difficult to obtain, but Sir James McGregor in his "Medical Sketches" writes that "the French, it was said, sent home from Egypt to France 1,000 blind men".

(page 147).

Larrey, in his "Mémoires", states that in the latter months of 1798 "almost every one" suffered, while in 1799 the army was almost exempt from the disease. This he attributes to the hardships and desert marches of the former period, chiefly to the lack of overcoats and sufficient warm covering for night bivouacs. After the defeat of March 21st 1801 the labours of entrenching, combined with night chills, augmented by the flooding of a neighbouring lake, made the disease again very prevalent: "in the space of two and a half months more than 3,000 men passed through hospital".

(p. 218).

His opinion as to the causes of the epidemic is found in the following words: "La chaleur brûlante du

jour, la réfraction des rayons du soleil par la blancheur des corps répandus sur le sol de l'Égypte, ce qui fatigue et irrite les parties sensibles de l'oeil, l'usage immodéré des liqueurs spiritueuses et des femmes, la poussière entraînée par l'air, laquelle s'engage dans l'intérieure des paupières et détermine sur le globe une plus ou moins grande irritation, surtout la suppression de la transpiration cutanée par le passage subit du chaud au froid, l'humidité et la fraîcheur des nuits pour les militaires qui bivouaquent; telles sont les principales causes de l'ophthalmie." (p. 209).

Assalini, who also had large experience of the disease among the French troops, discusses the causes with considerable fulness, and after refuting the theory as to the effect on the eyes of saltpetre or chalk in the air, he concludes as follows:- "Je ne prétends pas dire que la poussière du sol d'Égypte ne soit pas nuisibles aux yeux; mais je pense que, seule, elle ne suffit pas pour exciter l'ophthalmie; et il me semble plus vraisemblable d'attribuer cette maladie à la suppression de la transpiration qui a lieu très souvent en Égypte, principalement la nuit, et qui, se jetant sur la partie la plus affaiblie, choisit quelquefois les intestins, et plus souvent les yeux fatigués par la lumière trop vive du soleil. Voilà, à mon avis, la véritable source de l'ophthalmie d'Égypte". (Observations p. 110).

Bruant, who was also attached to the French Expedition, writing in the "Histoire Medicale de l'armée de l'orient", (Paris, 1802), mentions as causes "l'action réunie de la chaleur et d'une trop grande clarté . . . à celle-ci viennent s'en joindre d'autres non moins puissantes, parmi les quelles on doit principalement ranger, d'après Prosper Alpin, cette poussière brûlante, nitreuse, qui le vent souleve sans cesse dans l'atmosphère". In this opinion he is supported by Savaresi, another of the French Surgeons.

These extracts represent the conclusions arrived at by the medical officers of the French Army, not one of whom seems to have even contemplated the possibility of the condition being a contagious one, propagated by contact and social and domestic intercourse. As Edmonston remarks, "Not one of the French physicians that were in Egypt ever suspected the existence of a contagious principle in the production of disorders of the eyes" (p. 96). Vetch, in pointing out how completely Assalini had overlooked "many circumstances respecting the existence of the disease in Egypt, which are inexplicable by reference to atmospheric influence alone", goes on to say that "so late as the visit of that eminent surgeon to this country in the year 1813 he maintained the non-existence of any such quality in the disease". (p. 176).

The English troops seem to have suffered as

severely as the French. As Hourmouziadès^u remarks, "la plupart des soldats de ces deux armées ne tardèrent pas à contracter la maladie" (p. 18). At Ghizeh and elsewhere several large hospitals were established for the treatment of ophthalmia, and McGregor records that from those regiments alone which joined the Expedition from India no less than fifty men were invalided home with blindness (Medical Sketches p. 147).

The disease not only raged amongst the troops in Egypt, but was carried by them to the various stations touched at on their way home, and spread with alarming rapidity in the barracks and garrison towns of England, Scotland and Ireland, and thence to the civil population. "On the return of some of the Egyptian regiments to Malta the inferior class of courtezans were among its first victims, and, by degrees, it became very general over the land." (Edmonston p. 47.)

"At Gibraltar it became from that time by no means an infrequent complaint among the troops who had never been in Egypt" (Vetch's Treatise p. 180).

"Ophthalmia appeared at the same time in the most distant parts of Great Britain: and that peculiar modification of it, Egyptian Ophthalmia, is now familiar to almost every medical practitioner" (Edmonston loc. cit.). The disease thus suddenly and prominently brought under the notice of English surgeons was studied by them with the most observant and painstaking care: and they "were undeniably the first to draw

attention to the fact that Egyptian Ophthalmia is contagious and produces quite specific tissue changes in the conjunctiva" (Boldt p. 11).

The credit of first elaborating a proof of the doctrine of contagiousness undoubtedly belongs to Arthur Edmonston, who, in 1802, published a pamphlet entitled "An account of the Ophthalmia in the 2nd Regiment of Argyllshire Fencibles": this he incorporated in his "Treatise on the Varieties and Consequences of Ophthalmia" (Edinburgh, 1806). In the preface of his Treatise he writes:- "Although far from pretending to have been the first who suggested that Ophthalmia is propagated by contagion, I trust, without incurring the risk of presumption, I may venture to claim the merit of having been the first who, by a copious detail of unquestionable facts, first endeavoured to demonstrate the truth of that principle" (p. iv.).

After discussing previous writers from Aristotle down to Boerhaave, he asserts that the only clear evidence of the contagiousness of Ophthalmia previous to the facts adduced by himself is found in a thesis published by Dr. James Armstrong in Edinburgh in 1789, entitled "De tuenda nautarum sanitate." In it is related at considerable length "an instance of a violent Ophthalmia which broke out in His Majesty's Ship Albemarle, apparently in consequence of having impressed the seamen out of a slave-ship which she fell in with on the coast of Hispaniola, both seamen and slaves

on board of which at that time were affected with the disease. The three impressed seamen were convalescent at the time of being taken into the Albemarle. The disease spread rapidly to the crew of the latter, and was at last checked by a careful separation of the sound from the sick." From Dr. Armstrong's own account, it appears that the disease shewed itself four days after the sailors were impressed, and affected twenty-five in all of the crew. "Morbo tam cito in dies ingravescente, ne latius pateret, praefecto navis aegrotos omni cum sanis commercio interdicere necessarium visum est. Quare facta, contagio non amplius viginti quinque affecit, et post quinque circiter hebdomadas quam primum in navem advecta fuisset omnino evanuit."

Edmonston's own argument rests largely on the facts relating to the Argyllshire Fencibles. The regiment was embarked at Gibraltar on January 29th, 1802, "in a healthy state" on board the troopship Delft, which had dropped the Guards from Egypt. The latter were transhipped there on account of "the sickly state of the Delft," the prevailing diseases on board being fever and ophthalmia. When the Fencibles were put on board she had lain for two months at Gibraltar and during that period "was frequently washed and fumigated." It is particularly to be noted, however, that one of the lieutenants of the ship "had lost the sight of an eye in Egypt from Ophthalmia and at that time laboured

under the disease"; also that though new bedding was provided, "the hammocks in which they lay, except a few appropriated for the use of the sick, had all been occupied by the Guards." The Delft arrived at Spithead on February 21st and lay in quarantine for seven days, the troops disembarking on the 28th. "One case of Ophthalmia occurred ten days, and six other cases seven days, before the landing of the regiment." During the next ten days twenty-one cases occurred, and up to the end of July, when the regiment was disbanded, "several hundred individuals had been seized with it."

After discussing all possible and reputed causes, Edmonston rejects them all in favour of "the operation of a specific contagion imported from Egypt" (p. 31). "The influence of this contagion does not appear to extend far from the source of its evolution, as, for a considerable time after the first appearance of the disease, it seemed to require almost immediate contact to communicate it to others; for it was confined to the soldiers, two of whom always sleeping in one bed, the sick and the healthy are often indiscriminately mingled together: it is probable therefore, from this circumstance, that a great proportion of the cases of this malignant Ophthalmia occurring in regiments are occasioned by the direct application of the virus to the eyes. Those individuals who have attentively guarded against too near an approach have in

general completely escaped" (pp. 45-46).

Other English observers besides Edmonston had been impressed with the evidence in favour of the presence of a *contagium vivum*. Thus for example, Sir James McGregor, who does not seem to have seen Edmonston's pamphlet, in his "Medical Sketches of the Expedition to Egypt from India," published in 1804, discusses the possible contagiousness of Ophthalmia and remarks, "So singular an opinion I would hesitate to offer on slender grounds" (p. 148). He draws attention, however to the fact that the disease was prevalent in certain regiments and in particular companies of these regiments, even confining itself occasionally to individual tents. He points out also that it did not attack the Indian contingent till after the latter arrived at Ghizeh, where one of the Ophthalmic hospitals had been established, and an English regiment badly affected, the 89th, was at that time lying, though in marching across the desert thither, heat, glare and "the salts contained in the soil of Egypt, which from the days of Prosper Alpinus have been supposed to be among the principal causes of the Ophthalmia of the country" had full opportunity to exert their influence. He also records the fact that two Europeans who volunteered to take charge of the afflicted, themselves contracted the disease and "suffered severely by it for several months." Very few officers suffered, and this McGregor attributes to

"the attention which officers pay to cleanliness." Lastly, he points out that the sailors of Battleships lying at Aboukir suffered severely while the disease was epidemic on shore; but on the other hand that the sailors of transport vessels were almost entirely exempt, owing to the carrying out by their officers of the instructions of Dr. Whyte, in medical charge of transports, that the sailors should be compelled "frequently during the day" to wash their eyes with cold water.

Patrick Macgregor who, on April 2nd, 1805, read before the Society for the Improvement of Medical and Chirurgical Knowledge an account of the Ophthalmia which prevailed in epidemic form in the Royal Military Asylum the year before, also cited a number of facts in support of the theory of contagiousness. He mentioned, for example, that in certain dormitories the progress of the disease could be traced "from one bed to another, in the order in which they were placed, until nearly the whole were affected"; also that "all the adults who did not mix with the sick escaped the disease, while those who were connected with them all suffered from it," with a single exception. He came to the conclusion that "closer connection with the affected person was necessary to produce it than what is requisite in most other contagious diseases," and also that "it was most contagious in its early stage when the inflammation was active and there was consid-

erable purulent discharge" (p. 37). In his "Additional Remarks" on the same subject, read on February 5th, 1811, he gives the cases of three nurses, all infected by accidental contamination of their eyes while syringing or washing the eyes of patients. His observations, however, were not published till 1812, in the 3rd vol. of the Transactions of the Society.

The most interesting and important observations of that period, however, were undoubtedly those of John Vetch, who, in 1807, published "An Account of the Ophthalmia which has appeared in England since the Return of the British Army from Egypt," and later, in his "Practical Treatise on the Diseases of the Eye," (London, 1820.) dealt fully with the question in all its aspects. While giving Edmonston the credit of having first pointed out the contagiousness of the Egyptian Ophthalmia, he claims that he was the first to prove that "the communication of the disease was exclusively produced by the application of the discharge from the eyes of the diseased to those of the healthy" (Treatise p. 179). His conclusions were based chiefly on the facts relating to the 2nd Battalion of the 52nd Regiment, the history of which as related by himself is as follows:-

The Battalion was formed in November 1804 at Bam-bury in Oxfordshire, by a draught of men and officers from the 1st Battalion. It moved to Newbury in Berkshire, where it received about 80 recruits, chiefly

from the Army of Reserve. Thence it marched to Hythe, where on June 9th, 1805, it was joined by 500 volunteers from the Irish Militia. The first case of Ophthalmia occurred about July 14th, and about a month later five more men were affected. "These cases did not attract attention as presenting anything in appearance different from Ophthalmia arising from the usual exciting causes, excepting the little benefit they derived from the mode of treatment resorted to, and the length of time to which they were protracted" (Account p. 7). The first violent case occurred on August 30th, and then the disease spread rapidly, so much so that from that time up to August of the following year 636 cases occurred out of a total strength of somewhat over 700: 50 men were dismissed with the loss of sight in both eyes, 40 with that of one.

On investigation, Vetch ascertained that the regiments which had returned from Egypt to Ireland had been quartered along with the Militia, and "the infection appears, from such evidence as I have been able to obtain, to have been communicated to them" (Treatise p. 181). It was from Militia regiments in which Ophthalmia had prevailed in Ireland that the draughts were taken for the 52nd, and on enquiry Vetch found that the men first afflicted in the latter had formerly suffered in Ireland (Account p. 6). The long period which elapsed between the return of the troops from Egypt and the breaking out of the disease

in the regiment in question is explained by the fact, the anatomical basis of which Vetch alone amongst early writers seems clearly to have grasped, that "long after the eye seems to have recovered its natural and healthy appearance, the complaint nevertheless exists, and is liable at all times to a renewal of its infective quality. If in a single case a renovation of the infectious discharge takes place, the crowded state of soldiers in barracks, and the free intercourse subsisting among men so situated, render its communication almost a necessity." (Treatise p.185)

Vetch notes a series of phenomena attending the incidence of the disease which go far to prove its contagious character. When it first broke out, it was "entirely confined to two barrack rooms, and these the furthest removed from each other." The regiment was marched from place to place, but no permanent influence was exerted on the disease by change of quarters. "It continued to prevail most in particular rooms; in one, only two men had the good fortune to escape its attack, while in others, up to this period, a single case did not occur. Among the officers only two were affected during the whole progress of the disease; the servants of both were previously taken ill" (Account p. 9). "All the attendants on the sick, who were particularly careful in avoiding such intercourse as might communicate a local disease escaped without exception; while the prevalence of the disease in

certain companies, without any difference in their relation to other causes, and among patients admitted into the hospital on account of other diseases, forms a striking contrast to the exemption of the former. Each company has a separate room, in which intercourse among the men is necessarily great. Many things are used in common; nor are they ever over scrupulous in washing their faces in the same water; and however attentively some men avoid this, they are all under the necessity of having recourse to the same towel. Many men who remained free from the disease, after it had affected all the others in the rooms to which they belonged, were in the habit of rather allowing themselves to remain dirty than make use of the barrack towel and always took an opportunity of washing at such a distance as to prevent the possibility of local contamination." (Account pp. 11-12).

Amongst other proofs against infection "through the medium of the atmosphere or by sympathy" he states in the Treatise that during the whole time he had had the management of the Ophthalmia hospitals there never had been an instance of any medical officer contracting the disease. "Two orderlies only of the whole servants in attendance on the sick contracted the disease, and both in consequence of the accidental application of the virus" (p. 180).

In summing up the evidence for the theory of

contagion as against that of climatic influence and humoural defluxions maintained by the French writers, he says:- "The unfortunate continuance of the disease, both in the English and French armies after their return home, and the repeated occurrence of a similar one in the troops of this country has spoken the fact in language too strong to be misunderstood" (Treatise p. 178).

Vetch grants, however, that climatic conditions, though quite ineffectual in originating the disease, "must be very powerful agents both in aggravating and keeping it up" (Account p. 16). "The general qualities of moisture, therefore, without any regard to the peculiarity of their origin, but according to the degree of their presence, may be considered as a principal cause in aggravating the disease whether it occurs in Egypt or in Britain" (loc. cit. p. 26).

Having now sufficiently discussed the history of "the Egyptian Ophthalmia," which is universally regarded as the fount and origin of Trachoma as it has existed in the Northern European countries during the last hundred years, we turn to the consideration of a question of vital importance to our present study. That question is, What really was Egyptian Ophthalmia? Was it a single disease or a number of diseases not sufficiently differentiated by the observers? If the former, was it Trachoma? If the latter, what part did Trachoma play in it? Though no answer can be

given to these questions with positive assurance, a study of contemporary records sheds enough light on the subject to afford a reasonable degree of certainty. Several facts stand out clearly. There can be no doubt, for example, that the disorder was epidemic in nature: even the French physicians acknowledge that. Again, it is clear that in severity it was by no means uniform; and the printed accounts reveal considerable differences as regards symptoms, course, sequelae, and results of treatment.

That many of the cases were mild in character, short-lived in duration, and almost innocuous as regards consequences, seems evident from the success in treatment obtained. Thus Larrey, after giving in detail the measures adopted by himself, remarks, "il en est résulté que, sur trois mille et quelques ophthalmies, il n'y en a pas en un seul qui ait perdu la vue" (p. 218). Assalini claims a similar result in over 2,000 patients who passed through his hands, and says that, after his régime had been adopted in the English hospitals, equally good results were obtained in them.

Edmonston, again, records that of the several hundred cases which occurred in the Argyllshire Fencibles "in not a single instance was it fatal to vision" (Treatise p. 22).

Vetch also, who is very emphatic in distinguishing Egyptian Ophthalmia from simple forms of the disease, which he says are "most frequently owing to certain

changes or states of the atmosphere" (Treatise p. 149), seems forced to the conclusion that amongst the thousands who suffered in Egypt there must have been many who were affected with the latter. For in his chapter dealing with that form of Ophthalmia, we find him saying:- "The English and French troops employed in that country, during the contest which ended so honourably to the British arms in the year 1801, were harassed by the universal prevalence of this disease. The second expedition of English troops was equally visited by its ravages The men suffered more in proportion to the officers of the English army, as the latter enjoyed a better though often incomplete defence from the coldness and dampness of the night: and officers employed in strictly military duty suffered more than those attached to the civil departments. Of four officers who slept in the same tent, two had the precaution to bind their eyes up every night when going to rest, and the two others did not; the latter were in a very short time attacked by the disease, while the other two escaped." (Treatise pp. 153, 158)

He also quotes with approval Assalini's statement as to the causes of the prevalent Ophthalmia. His position as to the relation of Catarrhal to Egyptian Ophthalmia is a little difficult to apprehend clearly: at times he seems to consider them totally different diseases, at others he speaks as if they were different forms of one disease, one a milder, originated by

atmospheric conditions, one a virulent (and with this exclusively he identifies Egyptian Ophthalmia) due to contagion. In his chapter "On the Purulent Ophthalmia of the British Army" he states that:- "From whatever cause inflammation of the conjunctiva may originate, when the action is of a nature or degree of violence as to produce a puriform or purulent discharge, the discharge so produced operates as an animal virus when applied to the conjunctiva of a healthy eye. And further, as the disease produced by infection is of a nature more violent and malignant than that produced by the impression of atmospheric causes, it will in every instance of extensively prevailing Ophthalmia occasion two different forms of disease, which, as long as they are considered as one and the same, will produce, according as the one or the other predominates, very discordant results." (Treatise pp. 175-176)

We may take it then as sufficiently proved that one element at least in "the Egyptian Ophthalmia" was an Epidemic Catarrhal Conjunctivitis, originated perhaps by climatic conditions, propagated by contact, excessive crowding together of men, yielding readily to treatment, and in most cases doing little permanent injury to the eye.

This cannot, however, by itself explain all the phenomena. Something else much more serious was also at work. This is evidenced by the large amount of blindness, absolute or partial, that resulted. The

figures for the 2nd Battalion of the 52nd have already been quoted. The 1st Battalion of the same regiment suffered even more heavily; for Vetch records that, after it had been ordered to Sicily in 1806, Ophthalmia "continued very much to cripple this otherwise fine Battalion. From this station alone, I believe, more than 130 cases were sent home totally blind." Many such statistics could be quoted proving the ravages wrought by the disease in the British Army. Assalini, it is true, claimed uniform success in the treatment of Ophthalmia, but, as Vetch shrewdly remarks, "there is ample evidence of its destructive issue in the numerous consequences which he describes."

In the second place, the symptoms as described by the authors of the time, are much more serious than those found in catarrhal conditions. A consideration of these is so strongly suggestive of gonorrhoeal conjunctivitis that we cannot avoid the conclusion that that infection played a very large part in the disease. Vetch lays great stress on the purulency of the discharge as a diagnostic feature. "The symptom," he says, "which above all others is characteristic of the disease, is the formation of a purulent matter," and this discharge, he adds, "stained the linen of the patient in the same way as the matter from gonorrhoea." (Account, pp. 32, 53) Both he and Edmonston, however, maintain that the two conditions were totally distinct and could be differentiated clinically. Vetch main-

tained that they "differed essentially, both in symptoms and termination." Edmonston remarks that "the two affections have no kind of similarity," though the distinguishing signs as he describes them are not very convincing: in gonorrhoeal ophthalmia the discharge is described as "from its commencement thick in its consistence, of a greenish colour exactly resembling the ichor of the urethra," while that in Egyptian Ophthalmia "comes on rather gradually, is for several days thin and pale coloured." The other distinguishing feature noted is that in the gonorrhoeal condition, the loss of sight occurs early, in the other it is "the effect only of a long continued disease." Perforating ulcers and rupture of cornea, often with total destruction of the globe, are mentioned in all the writers as common occurrences, points which at once rule many of the Egyptian cases into the gonorrhoeal category.

It should be noted in this connection that the connection between urethral gonorrhoea and gonorrhoeal ophthalmia was by no means understood at that period. Both the writers referred to, for example, are firmly convinced that the eye cannot be infected from urethral discharge in the same person, though the eye of another person may be infected: both distinguish clinically a gonorrhoeal ophthalmia contracted from infection from another person from that occurring in the same person due to suppression of the urethral discharge,

metastasis or sympathy. Vetch relates some experiments made by applying the discharge from eyes affected with Egyptian Ophthalmia to the urethrae of the same persons, with negative results; and these he considers as corroborative of his views regarding the immunity of the eyes from the gonorrhoeal discharge of the same person. In one case however, the discharge was applied to another person with the result that "purulent inflammation commenced in 36 hours afterwards, and became, with the addition of more tumefaction of the glans penis than usually occurs in violent gonorrhoea, a very severe attack of that disease." (Treatise p. 242) - an example we may employ to prove a different thesis from that originally intended - the fact that some cases of Egyptian Ophthalmia were gonorrhoeal.

Larrey suggested the dependence of Egyptian Ophthalmia on a gonorrhoeal infection, attributing it, however, not to infection, but to a sudden suppression of the urethral discharge, of which he actually recommends the re-establishment by inoculating a new gonorrhoea or injecting an alkaline lotion, "la quelle peut supplier a l'inoculation naturelle" (p. 215).

James Ware, in his "Chirurgical Observations relative to the Eye" (2nd Edition 1805), speaks of having seen gonorrhoeal ophthalmia in persons "entirely free of any venereal taint" and adds in a footnote: "The Ophthalmia that deprived of their sight a considerable number of our brave soldiers in Egypt during the campaign in 1801, and which is said to be endemic

in that country, appears to have been of this nature."

(p. 31)

Lastly, we find Mackenzie in his "Practical Treatise on the Diseases of the Eye" (4th Edition) so impressed with the great resemblance between the two diseases as to state that "the symptoms of gonorrhoeal ophthalmia by inoculation bear so close a resemblance to those of the Egyptian Ophthalmia, that it is unnecessary to detail them." As to diagnosis, he says that "there are no marks which can be absolutely depended on, by which to distinguish gonorrhoeal ophthalmia, produced by inoculation, from the Egyptian or contagious Ophthalmia," and as to treatment that it "ought to be exactly the same as in the Egyptian Ophthalmia" (pp.476-477).

That a gonorrhoeal infection played its part in the disease in question seems abundantly clear.

It now remains to enquire into the grounds of the common belief in the connection between the Egyptian Ophthalmia and Trachoma.

The most obvious feature of Trachoma, as we see it now, is the presence of "granulations" on the mucous membranes of the lids, and it is with not a little surprise that one seeks in vain through the contemporary authors, with one notable exception, for any description of what seems so essential and easily noted a fact. The exception is John Vetch, clarum et venerabile nomen in the history of Trachoma. After

describing the early inflammatory symptoms, he points out that when the swelling of the lids has somewhat subsided, and examination is possible, the inner surface "over its whole extent presents the appearance of granulations," a term the use of which in this connection we owe to him. He notes that this condition is more marked in the upper, but more persistent in the lower lid, and also that the "adnata" of the globe "presents an appearance very similar to the florid red granulations of the palpebrae, disposed in a variety of folds and doublings, resembling more the valvulae conniventes of the small intestine injected with vermilion than anything else to which I can compare it." (Account pp. 54, 56.) This condition of the lids he says in some cases "disappears rapidly and of itself" (Treatise p. 202), while in others, instead of subsiding, it acquires, "either by the operation of new sources of irritation, or from a morbid obstinacy in the part itself, a further increase of size so as to produce a rough, scabrous, or granulated surface, with a secretion of purulent matter," a condition often leading to "Opaque Cornea" (pannus) (op. cit. p. 67). He points out that the granulations when cut away are reproduced, and that the opacity of the cornea, if once established, is not removed by the complete cicatrisation of the granular condition. He also clearly saw the connection between the anatomical condition of the lids and

the liability to relapses. "No treatment can prevent relapses from taking place. As long as the lining of the palpebrae continues villous this accident is liable to occur, with all the severity of the original attacks" (op. cit. pp. 217-218). He insists strongly on the danger to society of convalescents being allowed perfect freedom of movement, and emphasises the duty in regiments and other bodies of men of daily inspection of all the apparently healthy. By attention to these facts he claims that he had prevented the multiplication of the disease "to an incalculable extent." He prints a coloured engraving of the granular condition of the lower lid "to impress the importance of this stage of the disease more effectually on the minds of others," and adds that "in regimental practice the disease was seldom suspected to exist unless the eye itself was either as red as the patient's coat or overflowing with matter." (op. cit. p. 225)

No clearer proof of the presence of Trachoma in the Egyptian Ophthalmia could be desired.

What proportion of the cases was Trachomatous it is now quite impossible to ascertain: the probability is that the various conditions we have discussed were mingled in proportions varying at different times and in different places.

As is said in the Report of a Special Medical Board appointed by the Commander-in-Chief to consider the subject in 1810:- "The purulent Ophthalmia prevails

at different times, and in different places, with very different degrees of malignity: and even in the same place, and at the same time, some persons suffer under the most violent symptoms of the disorder, whilst others have it in a comparatively mild degree."

Modern writers as a rule are agreed as to the composite nature of the malady. Thus Stephenson remarks that "all kinds of epidemic eye disorders were no doubt included under the generic term of 'Egyptian Ophthalmia.'" Many of the cases were probably of gonorrhoeal origin.

Trachoma, again, played an important part in the outbreaks Trachoma lay at the root of the matter" (Epidemic Ophthalmia p. 128). Boldt's verdict is that "there can be no doubt that Egyptian Ophthalmia included not only the Trachoma of the present time, but several quite different diseases, such as simple catarrh, follicular swelling and follicular catarrh, blenorrhoea" (p. 19), and Treacher Collins's that "the Ophthalmia which was introduced by the troops from Egypt was most likely, then, not one disease, but a mixed type, much of it being gonorrhoeal as well as trachomatous" (Boldt pref. XIII.).

One remarkable circumstance, however, still requires elucidation. The testimony of modern observers is practically unanimous that Trachoma, as met with in the present day, is from the outset a chronic disease: in fact most writers include in the definitions they

give of the condition a statement as to its chronicity. In the contemporary records of the period in question, however, the descriptions abound in pictures of an extremely acute onset and course, ending, it is true, (especially in Vetch's account), in a chronic disturbance of the normal conditions of the lids, but always highly inflammatory and copiously purulent at its commencement.

The explanation usually given of this discrepancy is that the disease has changed in character, being now only rarely seen in its acute form, and practically never as an epidemic invasion. Thus Stephenson states that in the times of the Egyptian Ophthalmia Trachoma "assumed a more acute form than is now usually the case" (op. cit. p. 128). Boldt says that it is "generally admitted that the acute form is now very seldom seen as compared with the chronic", and quotes several authorities in confirmation of his statement. (op. cit. p. 91).

Opposed to such opinions, however, is that of Hourmōziades who disbelieves altogether in the existence of an acute form of Trachoma, and writes strongly against the practice of identifying Egyptian or military Ophthalmia, as he prefers to call it, with Trachoma. "Qu'il se soit trouvé les cas d'ophtalmie militaire des cas isolés de granulations, cela paraît plus que probable; mais quant à admettre l'identité des deux affections, ceci nous semble tout à fait

impossible Par cette confusion de deux maladies, la plupart des auteurs, ce basant sur les descriptions du temps, ont été amenés à accepter que le trachome avait autrefois une marche très aiguë et était accompagné d'une abondante sécrétion, ce qui expliquerait la rapidité avec laquelle il se propageait. D'après ces auteurs, depuis qu'on ne voit plus d'épidémie, la forme aiguë s'observerait rarement" (p. 19, 20). Again, "certains auteurs admettent pour le trachome deux formes distinctes: la forme aiguë et la forme chronique; d'autres, et c'est la majorité, n'envisagent cette Ophthalmie que sous une seule forme, la forme chronique d'emblée. Nous nous rangeons à cette dernière manière de voir" (p. 32). The hypothesis of the transformation of one form into another he asserts to be quite inadmissible. From a study of the descriptions given by Larrey and Mackenzie he concludes that the Egyptian Ophthalmia "n'a aucun rapport avec la conjonctivite granuleuse. Le tableau qui nous est tracé de l'Ophthalmie Egyptienne ressemble de tous points à celui de l'ophthalmie purulente. On peut admettre que le processus granuleux tantôt remontrait d'emblée, tantôt se greffait aisément sur une conjonctive déjà atteinte d'ophthalmie purulente, malade par conséquent et sans moyen de résistance" (pp. 39, 40). His opinion thus seems to be that there was no such thing as acute Trachoma: that what appeared to be so was in reality a mixed infection, the

trachematous virus being implanted on a pre-existing acute conjunctivitis of gonorrhoeal origin. Alongside of this opinion may be placed that of Hirschberg who says that it is not improbable that the acute cases which are occasionally seen are "due to a mixed infection, the germ of acute catarrhal conjunctivitis being present in addition to the Trachoma germ" (Boldt p. 91). Treacher Collins seems inclined towards the same view for he remarks that "the alteration in the intensity of the symptoms which has taken place is due to the absence at the present time of the gonorrhoeal element" (Boldt pref. XIII).

Hourmōkziadēs is certainly too strong in his statement that granular cases, if present at all, were only isolated instances, at least as far as the English Army is concerned: a perusal of Vetch's work drives one to the conclusion that, whether accompanied or not by other acute infections due to the various forms of bacteria which have from time to time been observed in acute cases in modern times, Trachoma was present in a very considerable proportion of the cases. It is, however, a possible hypothesis that the disease in the French Army was of a somewhat different nature to that in the English: when we are dealing with mixed infections different elements may assume different proportions in various places, and it is conceivable that the disease as seen on the French side may have been more of a catarrho-gonorrhoeal type, and on the

English side more of a catarrho-granular type. This may be a possible explanation of the fact, "quite authenticated, though as yet inadequately explained", (Boldt p. 11) that the disease ceased to be epidemic soon after the return of the French troops, occurring only sporadically from 1801 to 1816, and that in no very virulent form, and that it spread very little amongst the civil population of France. Had there been a strong (though latent) Trachomatous infection, as in the English cases, the disease must have followed a similar course in France to that which was seen in England.

Boldt suggests that the disappearance of the disease was probably due to improved hygienic conditions, but gives no facts in support of the suggestion.

Others incline to the belief that the French surgeons were ignorant of the distinguishing marks of Trachoma and hence did not diagnose it, and it is pointed out that, while they denied its very existence in their midst, it was recognised by English Surgeons, Adams and others, who visited their hospitals.

Vetch, however, propounds a theory which has at least as much semblance of probability as either of these. He points out that on their return from Egypt the English troops were cooped up in barracks with all the conditions favourable for a spread of infection. Furthermore, the institution by Sir John Moore of a very rigorous drill amongst the Light Infantry

Regiments (which had suffered first and most heavily from Trachoma) associated with "punishments attending the slightest deviation from a complication of dress, by no means adapted with due regard either to the health or the comfort of the soldier", induced many of the men "to exchange what they considered the torture of the discipline for confinement with Ophthalmia", and in consequence the custom of artificially producing the disease by applying the discharge seems to have been somewhat prevalent. The French Army, on the other hand, after its return, "instead of being confined to barracks, and harassed by a fastidious discipline, proceeded from conquest to conquest, bivouacking in the field, or quartered on the inhabitants of the countries which they subdued". Vetch quotes other instances where active service dissipated a disease which had flourished in barracks. The simpler the form of conjunctivitis and the less free from the obstinate infection of Trachoma, the more readily it would benefit. Edmonston points out that during marches the Ophthalmia in the Fencibles invariably lessened in severity and extent, and we have seen that that was probably of an innocent nature.

It is quite probable that the disease as seen among the French soldiers, if poor in trachomatous elements (as has been suggested) would benefit in like manner.

We are now in a position to sum up the results of our study of the Egyptian Ophthalmia. We have seen

the presence of an endemic, almost pandemic, form of Ophthalmia in Lower Egypt, causing much blindness. We have traced the history of the disease, acute in character and often disastrous in results, which affected the French and English Armies engaged in that country in the early years of last century. We have reviewed the varying opinions regarding the etiology of the complaint, and seen the rise in England of a strong belief in its contagiousness. We have discussed its nature, and come to the conclusion that it was a composite disease, including, at least, Epidemic Catarrhal Conjunctivitis, Gonorrhoeal Conjunctivitis, and Trachoma; and we have found convincing evidence of the presence of the last mentioned in the observations of Vetch, who first described the destructive chronic granular condition of the lids. We have also come to the conclusion that the probability is, that Trachoma, as present in the Egyptian Ophthalmia, was, as now, essentially a chronic disease, but that the co-existence of acute bacterial infection, largely gonorrhoeal, has led many to the supposition that it presented itself as an acute affection during that period. We have also been led to the suggestion that the different elements concerned were present in different proportions in the French and the English Armies, and hence we have tried to explain the different course pursued by the disease in the two countries. Having elucidated, so far as our materials furnish us with facts, the nature and

conditions of this military Ophthalmia, "the point of departure of all serious studies of Trachoma" as Hourmonziades terms it, we now pass on to a consideration of Trachoma as it has appeared in Great Britain and other countries.

III. TRACHOMA IN THE BRITISH ISLES.

The Egyptian Ophthalmia continued, for many years after its introduction, to cause havoc in the garrisons scattered over the country. In 1810, we learn from Patrick Macgregor that no less than 2,317 men "were a burthen upon the public from blindness in consequence of Ophthalmia", that number excluding those who had lost the sight of only one eye. Vetch records that in the summer of 1808, 900 cases passed through the Ophthalmia hospitals, gathered from more than 40 corps. For more than a generation the disease continued to be a scourge of military life. How far it spread to the civil population is difficult to ascertain. Edmonston states that soon after the advent of the Egyptian Ophthalmia the disease appeared "in the most distant parts of Great Britain" "and is now familiar to almost every medical practitioner". (Page 47). Similarly Patrick Macgregor speaks of it as prevailing "not only among the soldiers and sailors, but also among the inhabitants of this country at large". Lawrence, on the other hand, asserts that "there is no dissemination of the complaint in the families or districts, to which the soldiers or other persons so afflicted return" (p. 251), and he cites this limitation of its spread into the civil population as an argument weakening the theory of contagiousness. Similarly, Mackenzie writes of it as "rarely seen in private life",

and mostly met with "in armies, on board ship, in poor-houses, or in large public schools" (p. 445).

Even could this point be satisfactorily settled, we should still be far from arriving at any adequate conception of the extent to which Trachoma proper prevailed in Britain. As we have seen, there was no differentiation of the elements entering into Egyptian Ophthalmia at the time of its appearance; and it was more than fifty years before any serious attempt was made in this direction. We have already considered the views of Vetch on the subject. About the same period Benjamin Travers in his "Synopsis of Eye Diseases" (3rd Ed. 1824) regards all forms of purulent conjunctival inflammation as merely "specific variations" of each other. He gives excellent descriptions of the "villosity" of the conjunctiva, of the swelling in the fornices as "folds and flaplike elongations", and of the final thickened, scabrous or granular condition (thus amply proving the existence of Trachoma); but he regards these merely as among the consequences of the suppurative condition in general, and remarks that some of the most violent cases of the latter had in his experience been "those produced by the matter of gonorrhoea applied to the eyes".

Similarly Alexander Watson in his "Compendium of the Diseases of the Eye" (3rd Edit. 1830) classes together all forms of purulent conjunctivitis arising

from infection as idiopathic: in this he includes Egyptian, gonorrhoeal and purulent infantile Ophthalmia: "the phenomena and consequences of the inflammation", he adds, "are the same in each, and they require the same mode of treatment."

Coming down a few years later, we find that Wm. Lawrence, who, in his "Treatise" (2nd Ed. 1841), gives an admirable discussion of the whole subject of the different forms of conjunctivitis, enumerates them as follows:- (1) Simple catarrhal, (2) Purulent Ophthalmia of newborn infants, (3) Purulent Ophthalmia in the adult, (4) Gonorrhoeal Ophthalmia, (5) Erysipelatous, pustular and strumous, (6) Variolous, morbillous and scarlatinous. The third, which corresponds to the Egyptian Ophthalmia, is described as the same affection as the second, "only modified in its course, duration, and effects by age" (p. 280); and later he remarks that the gonorrhoeal affection "presents all the characters of the purulent Ophthalmia in their fullest development". In this author, however, we find the first approach to a differentiation of Trachoma; for, after giving the usual description of the acute symptoms of purulent or Egyptian Ophthalmia, he states that "in many instances, however, the disorder does not exhibit these strongly marked characters. It begins almost imperceptibly, and continues in a form so chronic as hardly to excite attention. Its seat in these cases is the mucous lining of the eyelids" (p.234)

On the same page he speaks of it as "giving the patient but little trouble, and often unnoticed by him or the surgeon". Again, and perhaps more important still, he goes a long way towards recognising the distinction between Trachoma and Gonorrhoeal Conjunctivitis; for, in discussing the differential diagnosis of the latter from purulent or Egyptian Ophthalmia, he remarks that the pathonomonic feature of the last named is "the peculiar change of structure in the palpebral conjunctiva, that is, the formation of phlyctenae and of granular irregularities in the early stage, and the tedious and obstinate state of granulation in the chronic form I have not seen them in the gonorrhoeal" (p. 275).

Mackenzie, however, in the 4th Edition of his "Practical Treatise" (1854), fails to draw any satisfactory distinction and makes no attempt to isolate the Trachomatous conditions, either acute or chronic, from the catarrhal and gonorrhoeal inflammations.

This prevailing confusion in the authors of the period makes it impossible to trace the history of Trachoma as such. The extracts quoted prove conclusively that it was present, but carry us no further.

It has been asserted that the existence of Trachoma in this country dates from the period of the Egyptian campaign and the consequent spread of "military Ophthalmia". There is, however, sufficient evidence to prove

that this is not so, and that the disease, if a somewhat rare one, was certainly not unknown in Britain before that period. Writing of the purulent Ophthalmia Lawrence says:- "When we consider its marked character and serious consequences, it seems strange that it should so long have escaped notice. Yet our knowledge of it is subsequent to that more extensive intercourse with Egypt which took place during the contest for its possession between France and this country. I know of no clear description of the complaint previous to this epocha" (p. 230). A few pages further on, however, he writes as follows:- "The term Egyptian is improperly applied to it, in as much as the disease has appeared in various countries without any suspicion of contagion derived from Egypt. I cannot help thinking that it has existed in this country long before our intercourse with Egypt. Its not having been described does not prove its non-existence; the distinction between smallpox and measles, and between the latter and scarlet fever, are not of old date".(p.255).

When we seek for definite evidence in support of Lawrence's surmise, however, we find little. Stephenson refers to certain authors of the early part of the 18th Century who give directions as to the treatment of what was apparently a trachomatous condition of the lids, and it is possible that the disease described by the physicians of that period as "Mulberry eyelid" was of the same nature. Records are found here and

there of epidemics of Ophthalmia in different parts of Britain, some of which at least seem to have been of a mild, probably catarrhal, nature: for example, those Vetch refers to as having occurred frequently in Portsmouth and other centres before the advent of the Egyptian form. Some, however, may have included more serious, and possibly Trachomatous, elements. Frequent mention is made of an epidemic that raged in the neighbourhood of Newbury in Berkshire in 1778: "in the same year it prevailed in several of the English camps, where it was known by the name of the "Ocular Disease" (Mackenzie p. 441). In this connection it is interesting to note that the 2nd Battalion of the 52nd Regiment, in which Ophthalmia raged with such violence, was quartered in that district soon after its formation. Is it possible that chronic trachomatous cases found their way into the regiment amongst the eighty recruits from the Army of Reserve there enlisted, and at least helped to spread the disease?^x If this were so, the episode would furnish an exact parallel to what has occurred in the Prussian and other continental armies. (See later).

It is in Ireland, however, where Trachoma is still more prevalent than elsewhere in the British Isles, that we find the clearest evidence of the existence of that disease. Power, who wrote on the Egyptian Ophthalmia in 1803, states that "a species of the same

^xCf. pp. 19,20.

disease was frequently prevalent among the Irish peasantry and considered by them to be infectious". Vetch in his Treatise writes as follows:- "I have reason to believe that a purulent Ophthalmia is by no means infrequent among the peasantry in Ireland. I have seen both men and women who have said that they lost their eyes by an attack of Ophthalmia, which they described in such a manner as to leave no doubt in my mind of its having been a very bad form of the purulent disease of the conjunctiva". "It is a curious coincidence", he goes on to say, "that such a disease should be more peculiar to that country than to this and that in Ireland also the germ of the Egyptian affection should have been preserved and fostered into action, when little or no appearance of it had taken place in this country. And if a native disease like this do exist, from the history of that which chiefly prevailed in the army, the latter might be explained without reference to any foreign infection whatever; and had I not, by frequent opportunities afforded me of examining the disease imported from Egypt by the second expedition, been able to establish its identity with that consequent on the first, I should have attributed the dreadful prevalence which Ophthalmia has had in the army to the communication of a disease of Irish extraction" (pp. 168,169).

The description given by John Williams of "The

Ophthalmia of Ireland" in 1857 lends considerable weight to the probability of this Ophthalmia, so prevalent among the peasantry of that country, being largely of a Trachomatous character. After pointing out that a form of epidemic Ophthalmia "broke out in Ireland so long ago as 1720", and referring to Power's remark quoted above, he proceeds to say that the "Workhouse Ophthalmia" which raged in the years 1849 and 1850 was probably identical with that mentioned by Power and differed only in degree from that occurring among the Irish peasantry so frequently as to merit the title he gives to his pamphlet. His description of the clinical features of the affection, as seen by himself, leaves no doubt that he is dealing with typical Trachomatous disease. His work is of the greatest interest, for he seems to go decidedly further than any previous writer towards the recognition of the granular condition as an idiopathic disease.

"Ophthalmia in Ireland", he says, "is characterised by that peculiar condition of the conjunctival mucous membrane, termed "Granular lids" more frequently and in a severer form, than in any other country in Europe". This condition, he is firmly convinced, may follow every form of conjunctival inflammation and even simple irritation; but he also states that, though it may thus be a consequence of acute conditions, "it is more frequently chronic from its

commencement", and that, though there is certainly always some initial inflammatory action, this may be so trivial "as scarcely to cause more than slight inconvenience to the patient, who never thinks of seeking medical relief until the conjunctiva cornea^e or the cornea itself becomes affected". "Under favourable conditions, however", he says later, "it is apt to pass into the acute form"; and again - "acute inflammation of the conjunctiva frequently supervenes on the chronic form". No other author had approached so near to the modern conception of the disease.

In reference to Pannus, which is mentioned by all the writers, it is interesting to note that none of them, with the exception of Williams, draws attention to its characteristic position on the upper half of the cornea: he remarks that "in some cases" it is confined to that site.

Further than this it does not seem possible to go in elucidating the history of Trachoma in the British Isles. That the disease existed, especially in Ireland, before the advent of the Egyptian Ophthalmia seems all but certain; that it was not generally recognised seems equally certain: that it was not only brought into notice, but also much more widely disseminated at and subsequent to that time, there seems no reason to doubt; but to what extent it prevailed we cannot now ascertain. It was certainly not till

after the middle of the 19th century that its existence as anything but a complication or consequence of other forms of conjunctival inflammation was seriously considered. From that time onwards, however, we find it attracting notice on its own merits, and gradually it assumes a more and more independent position, first under the title of Granular Lids as in Dixon's "Guide" (1855), in which though still described as a consequence of the catarrhal, purulent and gonorrhoeal forms of Ophthalmia, it is deemed worthy of a separate section; and later under the more dignified titles which it bears at the present day.

However prevalent Trachoma may have been in Britain up to the period to which we have tried to follow its history, there is no doubt that from that time onwards there has been a steady decrease in its prevalence, doubtless due to the greatly improved hygienic and social condition of the great mass of the population.

Statistics collected by Treacher Collins relating to several of the large cities of the United Kingdom during the last 20 years show a steady decrease in the percentage of Trachoma cases and other eye diseases, with the single exception of Sheffield in which the figure has remained the same, viz: 0.72%. No Clinic in England or Scotland now furnishes so high a proportion as 1.0%; but Dublin reported 2.81% of Trachoma cases in the Royal Victoria Eye and Ear Hospital

during the years 1901-3.

The chief importance of Trachoma in Britain at the present day as regards the general population lies in the dangers connected with immigration. As has been said - "Trachoma in England at the present day is an alien disease, imported by aliens, propagated amongst aliens, and handed on to the native population by aliens".

Bishop Harman reports fourteen "recent" cases in 2,757 out patients at Moorfields in one year; of the fourteen only three were in "native patients", the proportion being 0.14%: the remaining eleven were in "aliens", the proportion being 1.6%, more than ten times as high. This danger arises not only from "aliens", but also from Irish immigrants who come in considerable numbers to the great centres of population and labour in England and Scotland. As long ago as 1855 Dixon remarked that "any person who has attended the practice of a London Eye Infirmary must have been struck with the fact that the severer cases of Granular Lids, with the attendant deformity of entropion and misplaced eyelashes, are met with among the more destitute Irish patients". The figures just quoted give adequate ground for Treacher Collins' verdict that "if Trachoma is to be stamped out in Great Britain, strenuous measures will have to be taken to check its spread in the sister isle".

IV. THE GEOGRAPHY OF TRACHOMA AND SOME CONSIDERATIONS
ARISING THEREFROM.

It was during the Napoleonic era, as in Britain, that Trachoma first came into prominence in Europe. There is no doubt, however, that there, as in Britain, the disease was in existence long before the national convulsions and movements of that time brought it into general notice. Careful search has revealed evidences of its existence in an endemic character, and in Finland and the Baltic provinces especially, it was undoubtedly at work in its insidious, chronic form long before it burst forth in the early part of the 19th century. "During the Napoleonic wars greater bodies of men had been marched up and down, and cast hither and thither throughout Europe, than at any time since the migration of nations and the Crusades. Under the influence of concentration in badly ventilated and filthy buildings, the countless insanitary conditions of a campaign, its many hardships and irregularities of life, combined with the very lowest level of hygiene at that period, the disease had grown with frightful violence, baffling all the efforts of the surgeons, and hindering and paralysing strategic movements". Boldt, p. 21.

At the present day the disease is found in practically every part of the globe, in some countries occurring only sporadically, in some in an endemic form,



and in others prevailing to such an extent as to merit the appellation of pandemic. In Egypt, for example, V. Millingen in examining 4,000 persons found 80% suffering from Trachoma. The same author states that in Central Asia 900 per 1,000 of the population suffer from the disease. Hirschberg ascribes to it 78% of all eye diseases in South China and Mujashita of Tokyo 75% in Japan. According to Treacher Collins the disease was as prevalent in Persia as in Egypt: "had Napoleon's ambition led him to sit on the throne of Jamshyd instead of that of the Pharoahs, there can be little doubt that the affection would have been introduced to Europe as the Persian malady" B. XI. Syria, Arabia and Palestine are all seriously affected, and for the Balkan States V. Millingen gives the following remarkable figures:-

BULGARIA	440	per thousand of population
ROUMANIA	680	Do.
GREECE	450	Do.
TURKEY	600	Do.

In the eastern part of Europe we find a strongly marked Trachoma belt stretching from North to South, beginning in Finland, passing through the Baltic States into East (and, to a less degree, West) Prussia, thence through Posen, Poland, Silesia, Galicia and Parts of the Austro-Hungarian Empire into the Balkan

States just mentioned. Great masses of figures have been accumulated relating to these regions: of these one or two illustrations may be cited.

In Finland it is stated that 30% of the cases of blindness are to be ascribed to Trachoma, the proportion in the neighbouring country of Sweden being 0.85% (N. p. 29). In 1897 Hirschberg reported that in examining 7,000 persons in East Prussia he found 10% affected with Trachoma, 2% seriously: in higher class Schools the proportion of children affected was never less than 5% and in the village schools the proportion was much higher. (B. M. J. Epit Feb. 20/97). In 1894 Vossius gave the figures for the same province as 134.3 of all eye cases, and from the University Clinic of Königsberg he states the figure as 278.7 per 1,000 (Internat. Congr. of Hyg. and Den. B.P. 1894). The corresponding figures for Posen by different observers vary from 119 to 160 per 1,000. Poland is notorious and the neighbouring parts of Russia also possess an unenviable reputation: indeed the whole of the Russian Empire is afflicted, Hirschberg's figures for the different provinces ranging from 24-40 per 1,000 of eye cases in Moscow to 180-350 per 1,000 in Dorpat. In 1896 the proportion of cases in the Russian Army was given at the extraordinary figure of 62%. (B.M.J. Ep. July 23/98). Some parts of Austria Hungary are also severely afflicted: in 1895 thirty counties

furnished 30,000 cases for treatment: in 1894 Reuss reported the figures for Galicia as 110 per 1,000 of eye cases, and in the six years ending 1898 the hospital at Lemberg recorded 285.4 per 1,000.

These countries seem to hold the pre-eminence on the continent of Europe, but Spain, Italy (especially in the Genoese district and the Southern Provinces including Sardinia and Sicily), and also Portugal (Prof. Gama Pinto, Director of the Ophthalmic Institute of Lisbon reported 125 per 1,000 cases to the B.P. Congress) all suffer severely: Belgium and Holland less so, while France with the exception of one or two parts, e.g. round the Gulf of Lyon, is comparatively free, the Scandinavian countries and Switzerland being almost entirely free of the disease.

It prevails along the North Coast of Africa. How far it is found amongst the negroes of the Continent is uncertain. Amongst the Dinkas, in the Sudan, South of Khartum, Trachoma is reported as rife by Dr. Lloyd (C.M.S. Khartum Mission). As to South Africa the evidence is conflicting. Dr. Abercromby reported it in 1894 as unknown at the Cape, and Dr. Kitchener as very rare, he himself having seen six or seven cases in negroes or mulattoes (Internat. Congr. B.P.). Lewkowitsch on the other hand reports it as frequent among Boers, Kaffirs and Hottentots alike (B. 76).

A form of Ophthalmia known as Sandy Blight, all

differing somewhat clinically, but evidently trachomatous, prevails in Australia. At the Intercolonial Medical Congress of Australia in 1889 it was stated that "in these Colonies it is perhaps more prevalent than in any part of the globe inhabited by Europeans.. Both in the endemic and epidemic forms the sequelae of this disease have been by far the most frequent cause of blindness in the Colonies, not on account of the serious nature of the disease at its commencement but owing to its being allowed to continue in a chronic form, inducing trachomatous pannus, ulcers of the cornea, and all the disasters resulting therefrom". The same author asserts that "we have a very large number of cases of young people with only a moderate amount of trachoma and pannus of not a very pronounced character". Another speaker referred to the prevalence of cases of Ophthalmia which, on examination, turn out to be granular lids, and stated that "the aborigines never suffer": having had opportunities of examining their eyes, especially in penal settlements, he had been unable to discover any cases of it.

Information as to South America is scanty, but the disease certainly exists. In North America and Canada Trachoma is found chiefly in immigrants from Europe, and stringent measures are now taken to exclude all persons suspected to be suffering from the disease.

Two factors render the production of a

satisfactory Trachoma map impossible:-

- (1) the insidious nature of the disease: it frequently remains unrecognised till the eyelids are everted and examined and a complete survey would necessitate the examination of the total population in places where it is endemic;
- (2) the still prevailing uncertainty as to diagnosis: this probably accounts largely for the conflicting reports of different observers.

A table compiled by V. Millingen is subjoined: it has little value, however, as far as the actual figures are concerned.

PERCENTAGE of TRACHOMA to other EYE DISEASES.

England	...	...	0.07	Turkey	...	...	18.00
Scotland	...	...	0.70	Bulgaria	..	...	20.00
Ireland	...	...	3.00	Russia	...	...	25.00
America	...	...	3.00	Greece	...	...	25.00
France	...	...	4.00	Italy	...	...	25.00
Belgium	...	...	4.00	Portugal	..	...	25.00
Holland	...	...	7.05	Central Asia	...	...	45.00
Spain	...	...	11.09	Africa	...	...	50.00
Hungary	...	...	12.00	Roumania	..	...	52.00

At this point a number of interesting questions emerge, arising from a study of the geographical distribution of Trachoma, but closely related to considerations of etiology.

1. A notable feature of the disease as found on the Continent of Europe, especially in Prussia, Russia and Austria Hungary, is the influence of the military system in vogue in these countries on the spread of Trachoma in the civil population. The subject first came into prominence in Belgium, where, after much enquiry into what was then known as Military Ophthalmia, it was decided in 1834 to disband the regiments afflicted, with the result that the disease was carried far and wide through the land by the discharged soldiers - a classical experiment on a large scale which did more, perhaps, than anything else to establish the contagious character of the disease.

It has been found, however, that not only does the army give Trachoma to the civil population, but that it in turn receives it thence. It has been ascertained that latent cases are frequently drafted in amongst recruits: the conditions of barrack life foster the disease, which, from a quiescent dry non-infective state, is aroused to a mucopurulent, highly infective condition. Those afflicted are treated incompletely, sent out perhaps with a slight, hardly noticeable discharge from the eyes, and on returning to their homes spread the infection where it had not before existed. A vicious circle is thus established, exceedingly

difficult to break through. It is unnecessary to quote any of the numerous authorities: the matter was succinctly stated by one of the speakers at the Moscow Congress as follows:- "La population qui donne le Trâchome à l'armée le reçoit à son tour en abondance au moyen de congés donnés aux soldats atteints du mal non guéri. Cette dernière voie de propagation du Trachôme est la plus fréquente et la plus dangereuse au moins chez nous en Russie: il en résulte un cercle vicieux entre l'armée et la population."

Elaborate regulations are now in force in the countries involved for the examination both of recruits and of time-expired men; and it is interesting to note that in their main essentials these were clearly and logically enunciated by John Vetch, whose words have been quoted.

2. Another fact which emerges from a study of the geographical distribution of Trachoma is its close dependence on the social and hygienic conditions of life. Van Millingen laid it down, as the first of the conclusions arrived at in his report on the disease presented to the Buda-Pest Congress, that "Trachoma is a contagious disease, tending to disappear with the progress of hygiene and civilisation: it does not attack persons who follow the rules of hygiene and cleanliness, even in countries ravaged

by the disease." He remarks, further, that it is found wherever ignorance or uncleanness are found, in the Polar regions, in the equatorial belt, and in the isles of the ocean. That there is a "remarkable coincidence between Trachoma and illiteracy" he illustrates by means of the following table :-

<u>Proportion of Trachoma to other Conjunctival Affections.</u>	<u>Proportion of Illiterates to Population.</u>
Tomsk 85%	Samara, Tomsk ... } ...
Samara, Saratos ... 82%	Saratos ... } 85%
Roumania 52%	Viatka 76%
Viatka 45%	Roumania 68%
Spain, Italy ... 25%	Turkey, Spain ... 60%
Turkey 18%	Italy 47%
Hungary 10%	Hungary 43%
Pays - Bas 7%	Ireland, France 28%
France, Ireland ... 4%	England 6%
Austria 1%	Austria 5%
England 0.9%	Pays - Bas ... 4%
Sweden, Norway, ...	Switzerland ... 1.20%
Denmark, Switzerland	Denmark 0.75%
smaller fractions	Norway 0.25%
	Sweden 0.23%

As an illustration of the large amount of investigation devoted to this subject, we may take the interesting study of Trachoma in Algeria

contributed to the International Congress of Medicine in Paris by Professor Ed. Bruch. The disease is endemic all over the country, affecting all races and nationalities. Amongst the foreigners resident in the littoral Bruch found it varying noticeably according to hygienic and social conditions, while amongst the indigenous tribes the same is markedly seen. Moors and Arabs, who perform their Koranic ablutions and live cleanly, are comparatively free, while the Kabyles are very subject to the disease. "Le Kabyle est essentiellement sale. La famille vit entassée dans le gourbi et grouille dans un état de malpropreté repoussante." Even amongst the mountains, 1,200 metres high, "le plus grande nombre d'adultes et tous les enfants sont granuleux." Amongst the Jews, it is noticeable that the poor furnish "un contingent énorme à l'armée des granuleux"; while in the well-to-do Jewish families of the cities the disease is rare. On the Steppes and in the Sahara the inhabitants belong to two categories, the nomads, living in tents in the open, and the "sedentary" aggregated in towns, villages or cases: the former are almost free of the disease, whilst amongst the latter it is rife, and the more so the greater the filth and overcrowding of the huts in cold weather. Bruch's general conclusion is that the disease is one of poverty, the chief factors in its spread being want of cleanliness

and hygienic precautions, "physiological misery" and the aggregation of individuals: race, altitude and latitude have in themselves no influence. In this view of the disease the general body of writers on the subject agree.

3. A certain number, however, take a different view, and while in most cases not altogether denying the effect of hygienic and social conditions, place much greater emphasis on the influence of race. Among these may be quoted Swan Burnett, Chibret and Yarr. The first holds that "race and country undoubtedly play an important rôle in the causation and development of Trachoma," and the last asserts the extreme position that there are two great factors concerned, to which want, overcrowding, filth, etc., "are entirely subordinate, viz. race, and, longo intervalle, climate."

The discussion has ranged itself chiefly round the question as to whether certain races do or do not possess a peculiar immunity. On one side we have those agreeing with van Millingen, who states categorically that "une immunité pour certaines races n'existe pas," and on the other, those who hold that there are certain races which possess a remarkable insusceptibility to the disease.

The fight has raged chiefly around the negro. Swan Burnett and other American physicians with extensive practice among both blacks and whites

have brought forward a large amount of evidence to show that there is a marked difference between the two races as regards this disease. Burnett says that "in an experience of nearly twenty years and embracing many thousand eye cases, from the race (the negro) I have seen not more than three cases of genuine Trachoma and these were in persons of mixed blood and even in these cases the diagnosis may not have been certain. I have yet to see a case of entropion in a negro due to it; and, after all, the cicatricial contraction of the conjunctiva is the only certain diagnostic characteristic of the disease." That the racial factor is the deciding one he maintains on the ground that "the negroes from which my clinic is drawn live in as overcrowded and unhygienic quarters as the Irish labourers, yet the one race is a victim to Trachoma, while the other escapes." The same evidence regarding the American negro has been borne by numerous observers. Ray of Louisville with 800-1,200 cases annually amongst negroes has never seen a case of Trachoma. Dr. Home of Buffalo has the same testimony and quotes one of his confrères in Washington, who, with a negro clinic of 1,500-2,000 annually, has never had a case of Trachoma. Similarly Bordley, in the Bulletin of the John Hopkins Hospital (Feb. 1907), maintains that Trachoma does not occur in the American negro. Certain cases diagnosed by himself

and others as Trachoma had turned out to be an inflammation caused by the ~~seros~~^xerosis bacillus, which in its initial stages closely simulated the more serious disease, but yielded readily to treatment.

Regarding negroes elsewhere we have figures furnished by Dr. Santos Fernandez for Cuba, which show, not an absolute, but a marked comparative immunity.

<u>Population</u>	<u>Race</u>	<u>Trachoma Cases</u>	<u>Percentage</u>
460,000	Black	78	0.016
1,000,000	White	742	0.067
30,000	Yellow	33	0.111

Renner, with seventeen years' experience in Sierre Leone, "can affirm that there is not a single trace of this disease" amongst the negroes of that Colony or those brought in from the West Indies. In direct opposition to this, however, we have the evidence of Freeland, Government Medical Officer of Antigua, who asserts that Trachoma is "remarkably common amongst negroes in the West Indies," much commoner than amongst the whites.

Van Millingen's experience amongst the negroes of Constantinople is altogether different from that of practitioners in America. In 1894 he quoted his statistics as to race as follows :-

<u>Nationality</u>	<u>Patients</u>	<u>Trachoma Cases</u>	<u>Percentage</u>
Turks	1290	139	10.7
Greeks	2408	585	24.2
Armenians	1088	208	19.1
Jews	437	42	9.6
Negroes	24	5	20.8
Others	1670	113	6.7

It was urged by Chibret that the negro of the Levant was not "the pure article," having in most cases a strong infusion of extremely susceptible Semitic blood, which vitiates the argument. In 1897, at the Moscow Congress, van Millingen returned to the subject and characterised Chibret's explanation as unjustifiable. He maintained that the statistics founded on British or American experience are valueless, and that for the study of the influence of race on Trachoma it is necessary to take the disease in a country where it is prevalent and where different races are found together under similar conditions. He had, accordingly, executed a series of researches in Egypt, taking 1,000 persons of each of the following classes, in which he found a proportion of Trachoma cases as stated below :-

1. Indigenous

Mohammedans	...	...	86%
Koptes	...	...	85%
Jews	...	...	92%
Blacks (Schwartzes)	...	...	60%

2. Incomers

English Soldiers	...	0.0%
Syrians, Jews, Armenians, Hindus, Turks	...	24%
Negroes 5-30 years in Delta	... ..	50%
Negroes born in Egypt		70%

It seems difficult to explain the immunity of the negro, as seen in America, by any external circumstances, and it may be, as Swan Burnett has suggested, that different races of negroes are differently affected. This seems the more possible in view of the extraordinary difference between Canadian Indians and their brethren in the United States, the former, according to Yarr, enjoying an absolute immunity, while the latter, who belong to a different race, "are by no means free from Trachoma." "The Canglinawago tribe, the nearest to Montreal, live on a reservation situated in a low-lying, damp, marshy country, their huts are overcrowded to an unheard of extent; cleanliness is unknown; a large proportion are syphilitic, tuberculous, or both; epidemic diseases are common; eye infections too are common, with a single exception - Trachoma - which is never seen. A still more marked instance, showing the powerlessness of contagion to affect racial immunity, is that of the Cris and Santeux of Manitoba, who live side by side with the Russian

Mennonites under precisely the same conditions of defective hygiene. The Mennonites suffer greatly from Trachoma, blindness from this cause being very common; their neighbours, the savages, are never attacked."

Chibret and others have maintained a peculiar insusceptibility to Trachoma on the part of the Celtic races. This is all the more remarkable as the Irish are almost universally regarded as especially prone to the disease. Swan Burnett, for example, explains the prevalence of a malignant form of Trachoma in Kentucky and the mountains of Western Virginia by the fact that in many cases the antecedents were Irish or Scotch-Irish, who "are great sufferers and carry the tendency to the disease with them wherever they go."

The Jews are also regarded as especially susceptible. Prof. Gunning of Amsterdam, for example, has quoted the proportion of trachomatous to other conjunctival affections as 35% amongst the Jews, as against 2.6% amongst the Dutch. Poles, Italians, Spaniards and others also suffer in great proportion, but in all these cases it seems clear that the decisive factor is the hygienic one.

"The present position of the controversy," as Boldt truly says, "is that almost all statements as to racial immunity are subjects of dispute." While recognising freely that certain facts seem to

militate against it, one is inclined, after a perusal of much of the voluminous literature of the subject, to accept van Millingen's conclusion as probably the soundest. His words are:- "Il nous paraît très invraisemblables qu'il y ait des races qui soient refractaires pour le trachôme. L'immunité apparente est l'effet de l'hygiène ou des circonstances favorables résultant des causes naturelles ou attenantes à la manière de vivre."

4. At one time altitude was supposed to have a decided influence on the spread of Trachoma, and Chibret has tried to maintain the thesis that above 200 metres the disease exists only sporadically. This has been abundantly disproved, and altitude in itself is not now regarded as having any influence. The same may be said of climate, except in so far as that affects family life: where cold or damp conduce to overcrowding they indirectly foster the spread of Trachoma. These points are clearly brought out in Bruch's study of Trachoma in Algeria already referred to.

V. PATHOLOGY.

Before passing to the clinical study of Trachoma it is necessary to take a survey, however hurried, of current opinion as to the pathology of the condition.

1. Most writers are fully persuaded of the contagiousness of the disease. To quote only one or two, we find Matkovič asserting that "l'idée générale de contagion pour le trachome vrai ne fait plus de doute aujourd'hui pour personne"; and Hourmouziadēs that "sa genèse et sa propagation doivent-elles être attribuées principalement à la contagion". Boldt bears witness that the fact "that Trachoma is an infectious disease spread by contact is generally admitted". The only writers who throw any doubt on this belief are those who advocate strongly the influence of race. Swan Burnett, for example, does not regard its "occasional epidemicity" in asylums, barracks &c. "as evidence of an epidemic in the proper sense of the term, since an epidemic implies the presence of a microbe, and for Trachoma its positive existence has not yet been demonstrated" - reasoning which hardly seems convincing.

It is of interest here to note the action taken at the Belfast meeting of the British Medical Association in 1909 by the Section of Ophthalmology. "Mr Treacher Collins moved:

That the Council of the British Medical Association be asked to draw the attention of the Local Government Boards of the United Kingdom to the prevalence of Trachoma amongst the lower classes, to the damage to sight which it frequently entails, to the contagious character of the discharge from the eyes of those affected, and to the importance of preventing any transference of such discharge from one person's eyes to another by the washing appliances in the institutions under their control.

The resolution was adopted". (B.M.J. Oct. 2nd 1909, p. 978)

2. A great amount of labour has been devoted to the search for a specific microbe, but with entirely negative result. None of the numerous micro-organisms which have been found can be regarded as pathogenic of Trachoma proper. "The failure to find a specific organism has led some observers to doubt the existence of any (Mutermilch, Cuénod, Gunning); others have thought that many organisms can cause the disease in predisposed individuals (Cazalis); whilst others have had recourse to a last resource - mixed infection (Dawson and others)". (Parsons, Path. of the Eye Vol. 1, p. 74). Some writers incline to the view, promulgated by Alt, that the disease is in reality due to the gonococcus. Bishop Harman, for example, has arrived at the conclusion that "the Trachoma of our time is

probably the result of an inoculation of the conjunctiva with the B. Gonorrhoea of an attenuated virulence, the effects of the inoculation being so mild that they are not noticed; consequently in England we never obtain definite evidence of the organism, the cases being seen too late." It has been stated with regard to this organism that "while the infection of the eye with a virulent culture produces symptoms not to be mistaken, a virus which has lost its strength by age or drying may produce a disease of a chronic type that is clinically indistinguishable for the time from Trachoma" (Alger in N.Y. Med. Journal, April 1904). Swan Burnett, on the other hand, asserts that this theory has "no foundation in any fact except that already stated, that a purulent conjunctivitis may develop the disease in one in whom the tendency is latent."

It would perhaps be nearer the truth to say that such acute infections aggravate and bring into prominence already existing but unnoticed Trachoma; and it seems more than possible that a similar explanation will be found to account for the acute onset of the disease which is frequently described. The idea seems to be gaining ground that the essential pathological process at work in true Trachoma is slow and chronic, and that the exacerbations and remissions in inflammatory action, so characteristic of the clinical history of the disease, are dependent on adventitious

infections by the Koch-Weeks, the Morax-Axenfeld, * the pneumo-coccal or some other of the numerous organisms connected with acute conjunctivitis. As has been pointed out, "Trachoma in its general course, behaviour and results bears a close resemblance to tuberculosis." Just as the normally chronic action of the organism concerned in the latter, may, by the advent of other organisms (septic, pneumo-coccal, etc.), or by lessened local or general resistance of the tissues, due to causes not yet ascertained, take on an acute and rapidly progressive character, so it may be with Trachoma. In this connection it is interesting to note the reaction observed in cases of Trachoma to Calmette's ophthalmo-reaction test with Tuberculin. Schiele reports that in 27 cases of Trachoma, a positive result was seen in 18, and he draws the conclusion that in using the test for Tuberculosis in the system, Trachoma must be excluded; conversely, of course, it follows that the presence of latent Tuberculosis must be excluded before accepting a reaction as due to Trachoma. (*v. "Ophthalmoscope" Feb. 1909 p. 112*)

(cf. Treacher Collins in B.M.J., 2nd Oct. 1909.)

"I have frequently seen cases with fibrous tissue formation in the conjunctiva of long standing become the subject of fresh attacks of inflammation. An examination of the discharge has revealed the presence of Morax's diplo-bacillus."

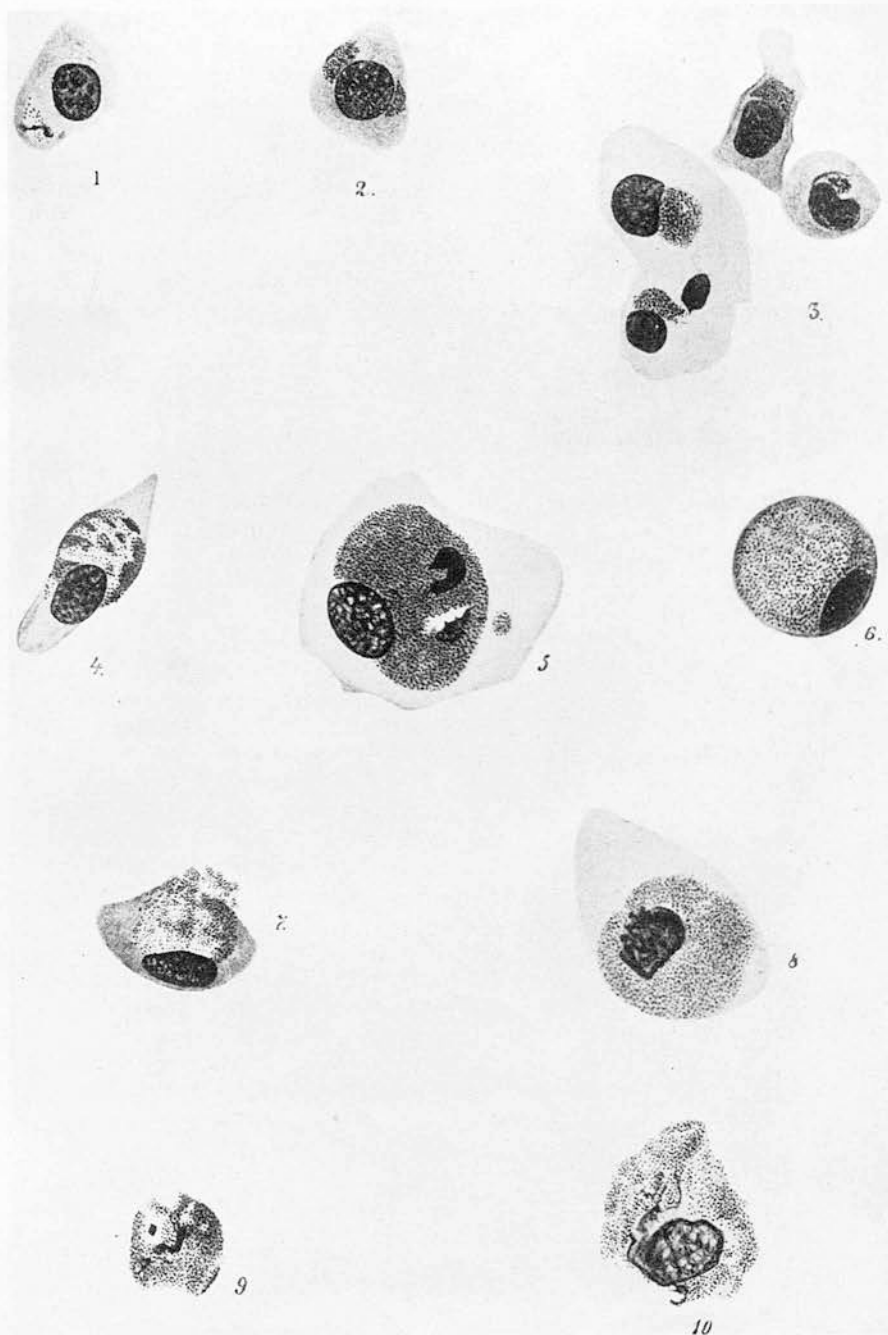
In the absence, however, of bacteriological evidence speculation may be endless and is necessarily inconclusive; so far, bacteriology has shed no clear light either on the diagnosis or the treatment of the disease.

3. During the last two years a fresh development of research has taken place, chiefly as the result of new and improved methods of staining. A succinct account of this from the pen of Prof. Greef of Berlin may be found in "The Ophthalmoscope" of Sept. 1909. He describes how after years of persevering search ~~of~~ a microbe he came to the conclusion that with the present methods such search was destined to be fruitless. After using the Giemsa method, however, he found he was "always able to obtain a certain characteristic result in Trachoma". This consisted in the discovery of round bodies of the nature of "cell inclusions", "much smaller than the smallest known coccus." These are now known as "Trachoma" or "Prowazek" bodies, from the name of an observer who found them in Java independently of Greef, Clausen and Frosch, who were simultaneously working on the same lines in Germany. Greef takes them to be "a living agent" rather than a cell degeneration, "certainly not bacteria", probably protozoal. He maintains that they are found only in trachomatous conditions of the conjunctiva, and asserts that he and his collaborators found them in every recent case examined by them. Their observations have been confirmed by others, e.g. Krudener, Leber, Pusey of

TRACHOMA.

DR. W. CLAUSEN.]

[DR. W. CLAUSEN.



Chicago and Herford (v. "Ophthalmoscope" June and Sept. 1909). On the other hand, Erdmann has reported similar bodies in material taken from eyes suffering from chronic conjunctivitis and ^v ⁿ ~~her~~ ⁿ ~~kal~~ catarrh, though he allows that they are much more numerous in cases of Trachoma; and Romer found the bodies with such irregularity and uncertainty that they quite failed, in his view, to possess any diagnostic value (McNab). It must be granted that the difficulties of observation are great and mistakes can readily arise, and in this, as in other questions of pure microscopic morphology, the personal equation counts for much.

The appearance and life history of the bodies are well illustrated by the accompanying plate, and notes taken from Clausen's paper contributed to the International Congress of Ophthalmology, 1909. In their earliest stage the granules are found scattered through the protoplasm of the epithelial cells (Fig. 1) or in clusters (Fig. 2) adjacent to the nucleus but separated from it by a narrow zone of clear protoplasm. As the parasite develops the granular intercellular mass increases in bulk (Figs. 4 and 5), until it completely fills the cell (Figs. 6 and 8) finally either destroying the nucleus (Figs. 9 and 10), or rupturing the cell envelope, so that the fine granules are extruded into the secretion (Fig. 7). This rupture of the cell and extrusion of the bodies Prowazek attributes to the use of re-agents, while Greef considers it a natural process of maturation. To find the bodies in scrap-

ings or conjunctival secretion it is necessary to use only fresh cases of Trachoma, for they absolutely disappear after a few days of treatment, reappearing, however, when that is discontinued. In cut sections of the lid they have been found not in the epithelium only "but also in the subepithelial tissue, in the lymph spaces beneath it, in the cells of the follicles (the lymphoid and so-called Leber's cells) and between the cells" (Greef), the pathology thus bearing out and shedding light on the clinical history of the disease.

Summing up Greef says:- "All this leads me to think that the eagerly sought pathogenic organism of Trachoma has now been finally found." The evidence cannot, however, be yet accepted as perfect; for no one has so far succeeded in cultivating the bodies, and even if they were cultivated the final link in the chain might still be difficult to complete, for all attempts to inoculate lower animals with the virus have failed. In certain of the higher apes a form of conjunctivitis has been set up, which, however, lacks the true clinical features of Trachoma, though it is highly interesting to note that in these cases Herford has invariably found the trachoma bodies present in the discharge.

4. The lack of certain knowledge as to any bacterial origin has induced many to look elsewhere for the determining factor, and much has been written regarding individual susceptibility and predisposition.

(a) Matkovic has investigated the chemical composition of the lachrymal secretion. The reaction was always alkaline, but the alkalinity was found to vary from 238 to 82 milligr. of KOH per 100 grm. of secretion. Reduced alkalinity was either constitutional, being markedly present in debilitated and scrofulous subjects, or due to such external circumstances as smoke, dust, etc., which cause increased lachrymation and hence dilute the secretion. In this reduced alkalinity Matkovic believes he has found one element at least, in personal predisposition, and he refers to the researches of others who have found the bactericidal property of the lachrymal fluid to depend on its alkalinity. He examined the fluid from 22 eyes affected with Trachoma and found the result "rigorously exact and altogether satisfactory."

(b) Many have tried to find an explanation of the incidence and spread of Trachoma in constitutional predisposition or diathesis. Thus, Swan Burnett regards it as "not a simple local disease ... but as the local manifestation of a dyscrasia." Similarly, Hourmouziades believes in "un terrain favorable à la maladie" and "la predisposition constitutionnelle." The constitution to which the predisposition attaches is variously described as scrofulous, lymphatic, or strumous. Thus the writer last quoted asserts that the granulations

"sont plus intenses chez les sujets lymphatiques et scrofuleux, plus disposés que d'autres à contracter la maladie," and again "les cas de Trachome consti^atés chez des sujets lymphatico-scrofuleux sont graves; au contraire la benignité s'observe chez les personnes exemptes de cette prédisposition ... Parmi les races, celles à diathèse lymphatico-scrofuleuse (prédisposante) sont les plus éprouvées." Boldt quotes a number of "writers of great repute" who "set scrofula more than any other condition in close aetiological relationship with Trachoma." His conclusion is that "although this hypothesis is not by any means fully established, we find so many authors supporting the view that Trachoma and scrofula are connected, that it cannot be summarily dismissed." Stephenson, however, is of the opinion that the theory "is open to grave objections and to more than one fallacy." He is unable to convince himself "that Trachoma is relatively more common among the undoubtedly scrofulous than among the healthy, or, what comes to the same thing, that the former class is more prone to Trachoma than any other," and he does not feel inclined "to attach any great importance to the diathesis as a predisposing agent" (p. 195). The presence of adenoid vegetations in the naso-pharynx, of enlarged glands and tonsils and "strumous" manifestations generally are common in those suffering from Trachoma; but all these condi-

tions are dependent largely on defective personal and social hygiene, and this, rather than any mysterious constitutional predisposition, is probably at the root of the matter both as regards adenoids and Trachoma.

5. This leads naturally to a question which has been subjected to endless discussion, and can not yet be said to be disposed of - viz. What is the relation of the follicular bodies (i.e. the "granulations") to Trachoma?

There seems to be little doubt that the granulations, Trachoma bodies^{*}, or follicles, as they are variously called, are enlargements of normally existing adenoid tissue to be found in the healthy conjunctiva. Especially in children, an enlargement of this adenoid tissue, in the form of follicles or granulations, readily takes place in response to stimuli of any kind - mechanical, chemical, or bacterial - and it has been found in the systematic examination of school children that a very large number show such a condition of their eyelids. It is well known that uncorrected hypermetropia will sometimes bring about a condition of folliculosis, and also that the instillation of certain drugs, especially atropine, will in cases cause a similar reaction. Besides these, there are the numerous cases of real conjunctivitis associated with follicular enlargement - follicular conjunctivitis. Hasty or inexperienced observers are apt to diagnose

** This use of the phrase is better dropped now to avoid confusion with the "Trachoma bodies" of Howard & Green.*

all cases of "granulations" as Granular Conjunctivitis or Trachoma, and hence has doubtless arisen the endless conflict and confusion of opinion which surrounds almost every aspect of the disease.

The question then naturally arises, Can cases of simple follicular enlargement be distinguished from Trachoma proper?

1. Clinically, it must be confessed that though much has been written on the differential diagnostic characteristics of the granulations or follicles of the two conditions, a certain diagnosis cannot in most cases be made with any assurance, if the follicles alone are considered.

2. Histologically, the matter is one on which there is, and has been for a generation or more, the sharpest possible difference of opinion. The follicles are typical collections of adenoid tissue, consisting of a stroma with lymphoid elements in its meshes, embraced by a network of capillaries, and, according to some, enclosed in a capsule, the existence of which, however, is strenuously denied by others. "Each of these constituents has," according to Parsons, "been the field of heated controversy," and on the general question as to whether the Trachoma body is or is not something distinct from the simple follicle, there is as great divergence of opinion. Matkovic, for example, after examining many specimens, says, "Ces recherches histologiques m'ont donné la

conviction que l'entité morbide du trachome est histologiquement tout-à-fait caractéristique, bien limitée et absolument différente de l'entité morbide de la conjunctivite folliculaire." The general trend of opinion, however, seems to be towards the view that "microscopically the follicle and the early Trachoma granulation are essentially identical," and that the histology of the one condition is practically that of the other (v. Parsons). Along with this view, however, practically all authorities are now agreed that the two processes are distinct, that the proposition that the simple form is the precursor of, and passes into, true Trachoma, is untenable. What then are the points of difference?

(1) The great fact that dominates the consideration of Trachoma is that it pursues an undeviating course, ending inevitably in cicatrization and contraction, leading to gross permanent changes in the tissues of the eyelids: this it is that renders the disease so disastrous. Simple follicular enlargement, on the other hand, whether accompanied by conjunctivitis or not, is a merely temporary phenomenon, disappearing quickly if properly dealt with, and never leaving any permanent tissue change behind.

(2) In Trachoma proper, besides the granulations, there is a marked hypertrophy of the tissues of the surrounding conjunctiva, which, histologically, consists of a "widespread infiltration with lymphocytes

especially of the adenoid layer, accompanied by oedema" (Parsons), and, clinically, reveals itself in the velvety, villous appearance especially to be seen in the swollen folds of the conjunctiva in the fornices. This, the pathognomonic feature of Trachoma, is entirely absent in simple folliculosis, and it is that determines the course and shapes the destiny of the disease. "Without this there can be no future development of scar tissue and the disease is a trivial one. The occurrence of lymphoid masses, indistinguishable from those of folliculitis, should be considered as an epiphenomenon and not as an essential part of the disease" (Alger in Med. Record, Jan. 24, 1903). It is interesting again to notice how clearly Vetch apprehended this feature of the disease, both as regards diagnosis and prognosis: had his teaching been followed much of the confusion and controversy consequent on inaccurate observation and hasty generalisation might have been avoided.

Too much emphasis cannot be laid on these essential features of true Trachoma.

VI. CLINICAL FEATURES.

1. Acute Trachoma.

It has already been said that the modern tendency is to recognise only a chronic form of true Trachoma. In the discussion at the British Medical Association Meeting of 1909, for example, Treacher Collins states emphatically that "Trachoma per se is essentially a chronic disease, the acute symptoms which sometimes usher in an attack, or which arise from time to time in the course of it, can always be accounted for by mixed infection." Most writers seem to have a difficulty, however, in breaking away entirely from the classical division of the disease into acute and chronic forms. Thus, for example, Boldt and Stephenson both give a detailed description of the former, in reading which, however, one finds nothing which absolutely negatives the theory that the condition in question may be an intercurrent attack of catarrhal or mucopurulent conjunctival inflammation implanted on an ordinary chronic trachoma, which resumes its normal torpid course after the visitation of extraneous organisms has passed. Boldt in fact states that the acute form in place of passing into the chronic may end in resorption of the granules, thus raising a strong suspicion that cases so diagnosed may have been examples of acute conjunctivitis associated with

folliculosis, not true trachoma.

The writer just mentioned says that the two eyes are almost without exception attacked together. Stephenson, on the other hand, states that one precedes the other by 3 to 10 days, the first affected suffering more severely than its fellow. For the rest, the symptoms described by both are practically those of a Koch-Weeks or other acute infection, viz. marked conjunctival congestion with, however, some pericorneal injection, papillary swelling of the lids, sometimes sufficient to hide the trachoma granules, and discharge. Stephenson describes two types, one severe and practically identical with purulent conjunctivitis, though he says that the chemosis is never sufficient to overlap the cornea as in true cases of the latter disease; in this form he says that pannus is sometimes developed "in the course of a single night," and that occasionally trachoma granules form in the cornea itself: the other, a mild type, shows palpebral swelling, but in a much less degree, while the ocular conjunctiva is free of redness except for a few vessels which may cross it; there is, however, commonly a zone of pericorneal injection 1 mm. wide. All gradations between these two main types may be met with.

In addition to the above symptoms is the presence of the typical granule or follicle, reddish grey or yellowish in colour, small, and deeply set amongst

the swollen conjunctival folds (sometimes concealed by them) especially in the fornices and towards the outer canthi. Ulceration of the cornea is a not unfrequent complication and is, as Fuchs points out, the chief danger in "acute trachoma" which he describes, however, as extremely rare, there being "scarcely any exception" to its occurrence in the chronic form; the ulcers may be peripheral and of the ordinary catarrhal form, or central and deep.

These acute attacks last a varying time according to their severity, usually about 3 or 4 weeks.

2. Chronic Trachoma.

In passing to the consideration of chronic or true trachoma, we find ourselves met with a multitude of forms, stages, complications, and accompaniments to be discussed. Various classifications have been adopted to facilitate a description of the history and development of the disease. None is entirely satisfactory, for cases constantly present themselves which will fit into no definite category. No two cases are exactly alike, and the same case may change its appearance completely in the course of a few days in response to treatment or other adventitious circumstances. Added to this is the fact that "it is well known that the course of the disease, and indeed all its characters, present certain differences in different countries," and, it may be added, at any rate in the North of

India, at different seasons of the year.

Clinical Classification.

Clinically we are told that the cases may be divided into (1) papillary, (2) granular, (3) mixed, and (4) gelatinous - a division which does not help one much, as practically all cases must be put into the "mixed" class if the division is strictly interpreted. Again, cases are divided into (1) dry, and (2) discharging; but what is a "dry" case one day may present itself as a "discharging" one twenty-four hours later, and with the application of appropriate remedies, revert nearly as quickly to the original class. Again, to classify cases as "mild," "moderate" and "severe" is to apply words to conditions which often do not merit them. An apparently "mild" case may resist all treatment and lead to the most disastrous and irremediable damage to sight, and a "severe" one be readily reduced to a more or less quiescent condition. The mildness or severity of a case is to be judged of by its reaction to treatment and its ultimate results as affecting sight, not by the obvious appearance it presents when first seen.

Hourmōziadēs, who disregards the "acute" form entirely, divides cases into (1) the formē simple or seche, i.e. those showing granules but causing no reaction; this form he says is uncommon, for the conjunctiva soon becomes vulnerable, and gives rise to

(2) the forme compliquée de catarrhe, the majority of cases being thus described as having some discharge which, by implication, is to be ascribed, not to the trachoma itself, but to an ordinary bacillary invasion of a somewhat devitalised and non-resisting tissue. He also describes (3) a forme mixte, by which he means the catarrhal form (2) associated with that hypertrophy of the mucous membrane usually, but, according to him, wrongly called papillary swelling. Here one is forced to disagree with the logical accuracy of the division, for the mixed form may undoubtedly be "dry". Like most writers he recognises that peculiar characteristic appearance where the entire palpebral mucous membrane becomes uniformly thickened, and smooth and glassy in appearance, the gelatinous, or, as he terms it, (4) the diffuse form.

Pathological classification.

Turning from clinical to anatomical and pathological considerations, we find ourselves in nearly as great difficulty as before. Excellent and detailed descriptions have been given of the various stages and the progress of the disease, the usual division being into (1) the stage of development and advance, (2) the stage of maturation and retrogression, and (3) the stage of cicatrisation and extinction, with the sequelae and results thereof. The difficulty arises in allocating the cases actually met with in practice to their

appropriate stage, and the difficulty, and often impossibility, of accurate classification, is borne out by pathological facts. It is universally recognised that the disease is one peculiarly liable to exacerbations and relapses. There is no stage till the final one of complete cicatrisation of the entire mucous membrane in which the symptoms of any one of the previous stages may not suddenly reappear, and consequently it is a matter of everyday occurrence to see cases presenting every variety of combination of clinical and pathological phenomena.

What is the originating and controlling force in these transformations has not been ascertained. Is it that the tissue already greatly weakened by the trachomatous invasion affords a specially inviting soil to other organisms which give rise to changes which again attract the original foe or rouse it from a dormant into an actively militant condition? The analogy in this respect as in others between trachoma and tubercle is one that invites speculation. A lung enfeebled in resisting power by a former attack of tubercle bacillus now lying dormant or possibly altogether extinct is peculiarly liable to the invasion of the pneumo-coccus which, besides finding a specially responsive soil, actually in some cases leads to a renewed and very acute and formidable invasion of the original malady. Again, we have the sudden lighting up of a widespread and acute tubercular infection

from a focus where the bacillus has been carrying on its work in its ordinary chronic and slowly progressive fashion. Whether this is due to an inherent faculty of the organism itself, or depends on some local or temporary peculiarity of the tissues attacked or on the co-operation of some other organism we cannot in most cases tell, and the question of the exacerbation and recrudescence of trachoma may, to compare small things with great, be placed alongside of that unsolved problem.^x

Keeping in mind these facts we can, nevertheless, follow the progress of the disease sufficiently to discover some guide both to the understanding of its condition in most cases that come before us and to the appropriate treatment.

First, then, we have the stage of deposit and formation of the trachoma substance in the mucous membrane of the lid. The inception of the process escapes observation, for it is rarely that symptoms arise at this stage. The patient when first seen usually comes to seek relief from a more or less acute catarrhal condition of the eyes. On everting the lids the velvety dark red appearance especially of the fornices at once attracts attention and along with that are usually seen a number of small deep set greyish bodies

^xOn the reaction of cases of Trachoma to the Calmette test v. Ophthalmoscope, Feb. /09: p. 112 &c.

embedded in the swollen conjunctiva. The papillary swelling and the granulations may either be alone present for a time or one may be in excess of the other, and we may accordingly class the case as "granular" or "papillary". Apart from these numerous cases which are first seen in reference to the catarrh of the eyes, there are some in which the complaint consists merely in a weakness or (as described in India) "rawness" of the eyes, which do not stand sunlight well, tire easily, are slightly gummy with reddish edges to the lids, which are also often lacking in lashes, and give rise to sensations which are described as varying from actual pain, through sandiness and itchiness, down to mere weight and indefinite uneasiness. Haziness of vision is also often the first symptom complained of and may be due to actual pannus in varying degrees, or to facetting of the cornea. On everting the lids of such eyes one is frequently amazed to find the extreme degree of granulation present, and it is often evident from the concomitant cicatrisation that the condition is one of long standing. Even these symptoms, however, may be absent, and one not infrequently sees cases where the disease is in its last stages without the patient apparently being conscious of anything amiss. Indeed in India it is no uncommon experience to see patients who have come for some other complaint, but who show the well marked thickening and droop ("ptosis")

of the lids due to hypertrophy of the tarsus or to dense gelatinous thickening of the palpebral conjunctiva so characteristic of trachoma: they will often strenuously deny ever having had the least trouble with their eyes and resent any suggestion towards treatment in that direction. Some few cases are also met with in which one has all the symptoms of a violent purulent infection of the eyes, which, on close examination, show the characteristic signs of trachomatous deposit. The granulations gradually increase in size till they assume the well known sago grain or frog-spawn appearance or, very commonly in India, that of rough, coarse, warty-like projections of a pale reddish colour, standing up well above the level of the surrounding conjunctiva. An extreme degree is reached in some cases where they appear as cauliflower or cockscomb-like excrescences, or occasionally as polypoid mushroom-like growths. The papillary swelling may remain in a subsidiary condition, but frequently it, too, grows and extends steadily assuming a more and more fleshy and succulent appearance, and occasionally quite obscuring the granulations which, in some instances, exhibit little activity. It sometimes appears as prominent thick fleshy rolls of tissue bulging out of the fornices, and may eventually assume very much the same appearance as that of the cockscomb development of the granules. In fact, in some cases one would be at a

loss to say whether these fleshy prominences are to be credited to the "granular" or to the "papillary" type - a matter of no practical importance as pathologically the two are identical. It is in such conditions that violent and purulent catarrh is especially apt to arise, and it is in this stage of the disease that is to be regarded as highly infectious.

This is frequently followed by a diffuse infiltration of the entire mucous membrane, which gradually loses its deep red velvety condition and assumes a pale gelatinous and glassy appearance, the granulations showing like minute drops of honey embedded in the jelly like mass of the swollen conjunctiva.

This marks the climax or stage of full maturation. What follows may be termed the stage of retrogression, which consists, however, not in a return to the normal, but in a steady progression towards cicatrisation of the mucous and submucous tissues, with all its attendant evils. The gelatinous deposit gradually shrinks, giving place to a thin atrophied whitish-blue tissue with fine cicatricial lines crossing it in various directions. The granulations gradually disappear, probably for the most part by absorption: that some, however, are extruded seems most probable, for during the stage of full maturation the mere eversion of the lid or the passing of blue stone across the mucous membrane is sometimes sufficient to express them. Some remain in many cases embedded in the cicatricial tissue

as yellow, fatty looking spots, and very occasionally they seem to undergo a calcareous change, becoming transformed into white chalky points which may cause irritation of the cornea. A ridge of thin bluish gelatinous tissue often persists for a long time along the upper edge of the tarsus after all the rest has become cicatrised, and even after all this has disappeared full eversion of the fornix may still reveal remnants of papillary or granular thickening.

When the stage of gelatinisation is absent the cicatricial changes appear in the midst of the thickened conjunctiva as bands of delicate fibrous tissue, mapping it out into islands which consist of papillary or granular thickening: these islands gradually diminish till the whole surface is occupied by a thin satiny, bluish membrane with fine white lines running across it in different directions.

The time occupied by these stages varies in different cases, but always runs to months and often to years.

Complications.

Corneal complications may arise at any stage, but occur chiefly during the stage of progression, especially during the period of marked granular and papillary enlargement. Pannus and diffuse infiltrations of an irregular character may arise early in the course of the disease, but generally coincide with active proliferation of the conjunctival tissue. Pannus is

by some ascribed to the friction of the granulations on the cornea, while by others the fact that large outgrowths are often present with a clear cornea and pannus with very moderately developed granulations is held to militate against that theory. It is held by most that the corneal affection is due to a real invasion of the trachoma elements, and Stephenson states that typical granulations are sometimes seen in the cornea. Though the bulbar conjunctiva may very occasionally (according to Boldt "frequently") be attacked by the disease, especially in the region of the semilunar fold and in the ocular fold of the fornix, it seems to be the case that the part of it lying above the cornea is rarely if ever affected. Hourmouziades, it is true, describes it as a rare result of the gradual extension of the disease:

"Malgré cette rareté de l'envahissement de la conjonctive bulbaire par l'élément granuleux, on observe exceptionnellement, chez des sujets présentant un terrain favorable, de véritables tumeurs, constituées par un tissu mollasse, gris-rosé, ayant tout à fait l'apparence d'oeufs de grenouilles, et implantées sur la conjonctive bulbaire. Ces masses granuleuses arrivent quelquefois à empiéter sur le bord de la cornée et à en recouvrir une partie. En pareil cas, la lésion cornéenne se borne à la partie recouverte par la tumeur; le reste n'est le siège d'aucune réaction." Swanzey states that "the bulbar conjunctiva

lying between the upper margin of the cornea and the fornix of the upper lid never becomes apparently diseased." On the theory of local extension, therefore, the involvement of the cornea is difficult to understand. Stephenson endeavours to explain it as an embolic process, trachoma cells being carried from the usual seat of the disease through the posterior conjunctival vessels which, besides supplying the fornix and conjunctiva of the lid, take part in the circumcorneal circulation. This he thinks may also explain the sudden onset of pannus which is sometimes seen.

It is possible that the cornea is directly infected through contact with the overlying lid, and to this view Fuchs gives his support. Bishop Harman has directed attention to the fact that granulations vary greatly in hardness, some which are prominent being soft, and others, though inconspicuous, very hard and rough: he believes that their hardness or softness, apart from mere size, may determine the corneal lesion, which would thus be accounted for by mechanical reasons after all.

Treacher Collins suggests that it is the outcome of both irritation from a roughened eyelid and a real infection of the cornea with trachoma (B.M.J., Oct. 2, 1909, p. 975).

Corneal ulcers also, though they may occur at any stage, are most common during the stage of progression. They are generally of a shallow, irregular form, with

infiltrated base, but not infrequently of the character of the clear so-called "absorption" ulcer: in cases with purulent discharge they may appear as deep ulcers, liable to perforate. Sluggish, shallow ulcers with rounded edges are not uncommon on the surface or at the edges of pannus or corneal infiltrations. Severe pannus, keratitis, and ulcers may be complicated with iritis and involvement of the uveal tract.

Parts affected.

All these conditions are seen sometimes in one eye alone, though the other seems always eventually to be affected by the disease. Very commonly both eyes are found affected and the disease may be in more or less the same condition or in very different conditions in the two eyes. Not a few patients are seen suffering from more or less catarrh of both eyes, of which, on examination, one may be found trachomatous and one free from any sign of the disease, or one with numerous and fairly young looking granulations and one in the stage of cicatrisation: it is in these cases that the adventitious character of most catarrhal conditions associated with trachomatous disease impresses itself on the mind of the observer.

The disease almost invariably attacks the upper lid first and chiefly, though the lower lid is in a certain proportion of cases also found affected, more, in the experience of the writer, by papillary thickening than by granulations. Boldt, however, states that the

granulations appear in 60% of cases, first in the lower lid, near either of the canthi, and in 28% in the upper, the region of the inner canthus being first implicated; in 9% of cases the semilunar fold is the initial site.

The mucous membrane of the lachrymal sac and canaliculi may also be attacked by true trachoma.

Sequelae.

It is in dealing with these that the intractible and disastrous nature of the disease is fully realised. Nothing seems to be able to arrest it, and, in India at least, it may be taken as an axiom that an eye once attacked by trachoma can never regain its normal condition. Early and persistent treatment can modify the prognosis, but can never render it good. Boldt, it is true, asserts that "it is frequently possible by early and appropriate treatment to stop the disease before the appearance of the cicatricial stage," but on the page next to that on which this statement is found we find him saying that "early proper treatment is not an absolute safeguard for a good result. Thus Deneffe of Brussels, who had the misfortune to become infected during the practice of his profession at the same time as his teacher Libbrecht, relates that though all possible measures were carried out from the very beginning, they did not escape any of the unfortunate sequelae of the disease. The same result befell

Coppez of Brussels."

It must be noted, however, that Treacher Collins who has had unique opportunities in the Ophthalmic Schools of London for observing cases (700 in number) carefully over prolonged periods believes in the possibility of cure: two cases of accidental infection amongst attendants were cured, he says, after about 18 months' treatment, and he states that he has seen "several cases which, on leaving, have shown no signs of fibrous tissue formation sufficient to have revealed the fact that they had suffered from the disease."

The sequelae may be classed into those affecting the conjunctiva and lid and those affecting the cornea.

1. Those affecting the conjunctiva and lid.

The inevitable contraction of the tissue in which the primary lesions are situated leads to (a) shallowing and obliteration of the fornix, as the result of which the whole conjunctival sac is considerably lessened in extent and the free movements of the eyeball somewhat restricted. It is a characteristic and common condition to find, with a finely scarred conjunctiva, an absence of any cul-de-sac, the eye being moored in a more or less tense sheet of tissue which, on opening the lids forcibly, is sometimes seen to be drawn into folds stretching between lid and globe. Accompanying this is often seen (b) a peculiar dryness and loss of sheen,

xerosis, which is sometimes so extreme that the conjunctiva looks like skin rather than mucous membrane, especially if, as not uncommonly in India, it be stained a deep brown or olive colour from too prolonged use of silver. The foam covered triangular patches at either side of the cornea are often well marked, and in some cases the dryness has spread over the cornea also, the whole anterior aspect of the eye assuming a scaly fish-like appearance, xerophthalmos. As the contraction of the conjunctiva advances it leads to (c) trichiasis, displacement inwards of the edge of the lid whereby the lashes are brought into contact with the eye. An aggravated form of the same defect is seen in (d) Entropion, where, owing to the infiltration and subsequent cicatrisation of the tarsus, the cartilage suffers an incurving, assuming a boat shaped form with the convexity forwards, whereby the edge of the lid is still further carried inwards. These two conditions are probably the commonest and most characteristic results of the disease. A minor deformity may be mentioned, though it hardly merits the title of a sequela, viz. that thickening and consequent enlargement and comparative immobility of the upper lid which gives rise to a common and characteristic sleepy appearance of the trachomatous patient, and is termed, somewhat loosely, ptosis. This usually passes off as the infiltration gives place to cica-

* On March 16th/19 a patient (female, aged 20) was admitted to Hospital with both upper lids greatly swollen & sunken the cornea, partially in the right eye & completely in the left. The cartilages were very thick, large & nodular: the palpebral conjunctiva hard & rough, with patches of pigmentation: the left lower lid was turned in & the cornea of that eye hazey.

An incision was made along the lid & the muscle dissected off the cartilages, which were found very friable in the left eye: a great part of it was scraped away & the rest excised: most of the right cartilage was removed with the knife. The patient left Hospital on the day this note is written (March 23rd) with the wounds well healed & the condition of the lids distinctly improved, though they still sunken & the cornea to a considerable extent.

trisation, and the tarsus and entire lid often finally become markedly smaller than normally, the cartilage being thin and atrophied, sometimes soft and fatty: in other cases some degree of thickening remains, and in one case I have found the cartilage actually ossified, its fellow being very thick but still fibrous: the ossified plate, which resisted all efforts to cut it, was removed entire, and the lid, which before was obstructing vision, recovered full functional activity.*

II. Those affecting the cornea.

Pannus, though it usually clears up to a considerable extent if satisfactorily treated, still frequently leaves some interstitial opacity of the cornea behind. In bad cases the entire cornea has been infiltrated and remains dim, frequently with one or two large vessels coursing over it. In cases where the affection has been deep and softening has resulted more or less general, Keratectasia results. Local opacities of the cornea, sometimes vascularised, are not uncommon remainders of the disease, and in cases where ulcers have perforated the usual sequelae (partial staphyloma, adherent leucoma, etc.) are seen. More characteristic than any of these, however, is the condition frequently met with in people with healed trachoma, of faceted cornea, often overlooked if careful examination is not carried out, and leading to an extreme degree of irregular

astigmatism and hopeless injury to vision. This condition arises from the development of the clear "absorption" ulcers mentioned above. Affections of deeper tissues are rather the result of severe pannus, ulceration, etc., and are not strictly speaking dependent on trachoma. Similarly such conditions as photophobia, blepharo-spasm, blepharitis, etc., do not require enumeration under this heading. As stated above, the lachrymal passages are sometimes invaded by trachoma, leading to epiphora, chronic dacryocystitis, etc. Elliot of Madras, who has removed and microscopically examined a large number of lachrymal sacs, reports that in a great many the sac lining shows well marked follicles, which he regards as almost certainly trachomatous.

VII. TREATMENT.

It is not proposed here to do more than indicate the main lines of treatment that have been used with advantage by the writer. The number of drugs and procedures that have been proposed and employed is legion: in discussing them Stephenson occupies more than 100 pages. As has been said, there is good reason for considering the disease incurable. The most that can be hoped for is to modify its progress and palliate its results. Concurrent complications (ulcers, iritis, &c.) and their results are to be treated on ordinary lines.

First, then, as regards the modifying of the progress of the disease, two drugs alone need mention, both escharotics, viz., silver nitrate and copper sulphate. The latter is the mainstay of treatment, and must be used in the solid or mitigated form regularly and for long periods. Where there is a catarrhal or irritable condition of the eye, especially if associated with photophobia or Blepharospasm silver nitrate solution in 2 - 4% strength solution is to be employed till these conditions have been removed, when it again gives place to copper. The latter is especially to be avoided if there is corneal ulcer or active Keratitis (as distinguished from true pannus) till these are reduced to a quiescent condition by appropriate measures. The *raison d'être* of this escharotic

treatment is to keep the proliferation of conjunctival tissue at as low an ebb as possible, for in exact proportion to the degree of hypertrophy which it undergoes will be the subsequent cicatrisation with its resultant ills: as Hourmon^uziadès says, "plus la conjonctive s' hypertrophie, plus la rétraction ultérieure est prononcée et plus la marche de l'affection est traînante". This, too, gives us the clue to the continuance of escharotic treatment. As long as there is hyperplasia it is in place and only so long: to apply powerful astringents to already cicatrised tissues can do only harm.

The most valuable adjuvant to the treatment by silver and copper lies in the actual removal of diseased tissues. Where granules are prominent and ripe, and the surrounding conjunctiva not markedly cicatrised or widely infiltrated with lymph tissue (gelatinous), this is best effected by expression of the granules. Two forms of instrument may be used, Knapp's roller forceps or Grady's forceps, of which the latter is to be preferred as causing less tearing and bruising of the tissues surrounding the granulations, an important point in carrying out this procedure. Expression, suitably practised, has sometimes a remarkably beneficial effect on the symptoms, but must be followed, after a day or two of rest to allow irritation to subside, by the regular and persevering use of copper as before. Where the granules are small, deeply set or few in number,

and where the papillary swelling is prominent, or has passed on into cicatrisation, or is becoming gelatinous, the use of forceps probably causes too much laceration to make expression a beneficial measure: the same holds in those cases where the granulations, though numerous and prominent, are very hard and resist ordinary pressure.

The other method of removing diseased tissue is by excision, and is applicable to cases which react very slowly or not at all to escharotic treatment, amongst these being often found those of the granular type last mentioned, as also some of markedly papillary type.

Where the fornices are thick and fleshy or gelatinous it is generally a great advantage to the patient to have them removed, and if carried out with due precautions, the operation does not lead to any counterbalancing evil result. In cases where the resistant tissue (either hard granular or thick papillary) is widespread over the whole or larger part of the conjunctiva and especially where it is causing corneal trouble, the whole of the affected area may be removed by Kuhnt's method, either alone or along with the ^{tarsus} ~~terms~~ if the latter is markedly affected by hypertrophy and incurving.

In many cases a strong silver solution, 60 grs. to the ounce, carefully applied to the everted lids is of the greatest use. It is followed by a considerable

degree of inflammatory reaction, but often "breaks the back" of a stubborn case, which can then be treated by more ordinary methods, which, however, cannot be brought into use till the effect of the strong application has passed off.

Passing next to the methods of palliating the evil results of trachoma, we have to consider first those seen in the cornea. Ulcers and Keratitis are to be treated secundum artem, the lids at the same time receiving appropriate treatment. Of the use of Jequirity or Jequiritol the writer has no personal experience: its sphere seems to lie amongst the dry granular cases associated with severe pannus. A useful and much milder method of improving the condition of the cornea is found in subconjunctival infections of a 4% salt solution (10 or 15 minims): after several injections at intervals of five or six days or longer the vascularity and dimness often improve in a marked degree. Peritomy has only a temporary effect, and is rarely worth practising. Dionin and mercuric oxide ointment are useful adjuvants, but, when all has been done, the cornea is often left in a condition far from satisfactory.

The operations that have been recommended and performed for the deformities of the lids are numerous, sufficient proof that none of them is entirely successful or suitable as a routine measure. Trichiasis and entropion are excessively common in India, and most large hospitals number their cases by the hundred

yearly. The operation most commonly practised seems to be the one known as the St. Mark's Hospital Operation with the omission of the grafting of mucous membrane from the lip: in other words, the edge of the lid is split from end to end to a varying depth, a large portion of the skin of the lid excised, and the edges of the raw surface thus left drawn together with two or three stitches. The result cannot be said to be good, judging from the cases of recurrence one sees. In not a few the lid has been shortened to such an extent that the eye cannot be fully closed, and as the trichiasis often returns, the condition of the patient is deplorable, especially as it is extremely difficult in such circumstances to carry through a satisfactory operation. The condition is regarded as trivial, being so common, and the cases handed over to subordinates for operation, with the result stated. The grafting of mucous membrane into the edge of the lid is a great improvement, but is omitted either from carelessness or because it adds to the time required for the procedure. If this operation is practised, the grafting should never be omitted: it is not necessary to put sutures in the graft as, if laid well in position and secured carefully by a suitable dressing, it adheres quite well.

One fundamental point to remember is that the operation should (ideally) not be performed till the process of cicatrisation is complete and the danger of further incurving at an end. Practically, however, it is not

usually possible to wait till such a period, and some method of operation must therefore be adopted which very effectually removes the lash bearing area from the globe. This, in my experience, is best effected by Arlt's Operation in which that area is fully separated as a bridge of tissue attached only at its ends and can thus be moved freely up the lid as far as deemed necessary. Sufficient skin is removed to lay bare a site for it and it is stitched in position. A little care in passing the stitches adds considerably to the effect of the operation. In making the upper incision to mark out the bridge it is usually found that the edge of the lid rolls inwards with the pressure put upon it with the result that the cut assumes a bevelled surface. The suture should first be passed through the edge of skin above to which the bridge is to be attached and then the needle is thrust into the bevelled surface referred to at right angles and well forwards, and deeply through the bridge so as to come out behind the eyelashes. On tightening the sutures it is found that the whole area is not only drawn up and away from the edge of the lid, but also revolved on a horizontal axis, thus lifting the hairs well forward. Further, by pressure on the upper part of the lid with the finger tip, the tarsus can be projected well down, in which position it should be secured by the dressing, as otherwise it may be pushed up and the bridge of tissue heal on to

the lid nearly in its original position. By the omission of this little manoeuvre the effect of the operation may be largely lost. The procedure is undoubtedly more severe than most of the other operations practised in this condition, causing more traumatism, having a considerably larger raw area to be covered, and requiring a longer convalescence. Its advantages, however, far outweigh its disadvantages, and if grafting is combined with the above measures the operation is as nearly perfect as any employed in this troublesome condition. A minor point requiring attention is that the ends of the bridge should be well raised, otherwise disappointing local recurrences towards either canthus may take place: similarly the mistake should not be made of hitching up any one point more tightly than the others, which may result in an ugly irregularity in the line of hairs which should be laid as far as possible equidistant from the edge of the lid in its whole extent. Any hair bulbs left in the latter should, of course, be carefully removed at the time of operation.

Spenser Watson's Operation is easy and gives very rapid healing, but the result is apt to be most disappointing as the fine hairs of the skin flap cause considerable irritation: after several such experiences I have entirely dropped the operation.

The only other operation that calls for mention is that of Snellen. For cases where the cartilage is

thick, hypertrophied and markedly boat-shaped, it is well suited, but if (as is often the case) it is soft, fatty and atrophied, the operation is ineffectual.

Recurrences may occur ~~an~~ even after well planned and carefully executed operations and are often local: these, as well as very mild cases, and those due to blepharitis alone, may be dealt with by some of the simpler measures, e.g. Van Millingen's Operation of splitting the edge of the part of the lid affected and grafting in mucous membrane.

VIII. SOME CLINICAL RECORDS.

The clinical study of Trachoma is difficult and unsatisfactory, and particularly so in the conditions prevalent in Indian Hospital practice. Very rarely does the opportunity present itself of following up a case for any length of time, and to be able to watch and treat one from its commencement to its ultimate development is an experience that is practically never enjoyed. In its ordinary phases the disease is regarded as too trivial for much attention by the native of India who, in this and many other things, displays an extraordinary power of passive endurance of discomfort. An intelligent man whose livelihood depends on good sight will frequently come for advice, but even he will practically never persevere in his attendance at any one hospital. When serious trouble arises help is eagerly sought, but patience quickly fails, and, unless the relief afforded is speedy and marked, the sufferer goes off to some other practitioner or quack whose fame has been sounded in his ears. For the most part, therefore, though the surgeon whose lot is cast in India has an extensive working acquaintance with the disease and its various manifestations and consequences, he has to confess that his opinions and practice are founded on a large number of incomplete observations rather than on a thorough and unbroken study of cases. To turn up the lids in practically every eye-case that

presents itself becomes almost a reflex act, and few things surprise him more in attending an outpatient clinic in Britain than the rarity with which this precaution is deemed necessary.

In this connection it may be pointed out that, in the examination of the palpebral conjunctiva it is an emphatic help to make use of a loupe or strong lens: the magnification of details adds enormously to the vividness of the picture. The conclusions arrived at by the writer, as the result of ten years' work in a highly trachomatous region, have been incorporated in the general discussion of clinical features. The following records, chosen from a large mass of material, are submitted as examples of the experience on which those conclusions are founded, and as enforcing some of the chief points mentioned.

Case 1. Salabat, male Mahomedan, aged 25 :

admitted on February 17th. Has had trouble with his eyes as long as he can remember: at present can hardly open them: entropion of both upper lids which, on eversion, are seen to be covered with red fleshy granulations closely crowded together: lower lid fornices also show plentiful granulations, and the conjunctiva at inner canthi is red and spongy.

There are no corneal complications in spite of the blepharospasm, and only a slight muco-purulent discharge. On the 18th, under chloroform, all visible

granulations easily expressed with Grady's forceps, and Arlt's Operation performed on both upper lids. On the 20th, the stitches were removed and on the 24th the patient left Hospital, the trichiasis completely relieved, the eyes opening easily and showing only slight congestion and discharge - a condition of things far better, the patient says, than he can ever remember having enjoyed before.

Case 2. Fazl, male Mahomedan, aged 35: admitted the same day as Case 1, with what looked like typical purulent conjunctivitis, swollen oedematous lids, the upper overhanging the lower, with copious discharge and great photophobia. He says he began to suffer 9 months ago, and for the last 2 has been practically helpless. On examination both corneae were found quite clear, but all the lids markedly affected with trachoma, the conjunctiva of the lower lids being fleshy and deeply congested with a few granulations in the fornices, that of the upper thickly studded with close set dark red granulations. On the 18th an attempt was made under chloroform to squeeze out the granulations with Grady's forceps, but they proved too hard. Silver nitrate, 60 grs. to the ounce, was carefully applied to all four lids and fornices, and the eyes bandaged. Next day the reaction was severe and the swelling and discharge increased. By the third day these had greatly diminished and under a weak Protargol lotion

the condition improved rapidly till in a few days the patient could open his eyes and see to go about.

Copper sulphate was then tried, but was followed by a relapse: after a few more days of mild medication the strong silver lotion was again applied, the reaction this time being much less than before. Improvement continued steadily and the patient was on the point of leaving Hospital when another relapse took place to something like the original condition, which he attributed to being exposed to the vapour of some pungent articles of food being cooked in the kitchen: the condition of the eyes again assumed the appearance described as typical of "acute" trachoma. A few days under Protargol were sufficient to dissipate this, and on the 9th of March the patient left, refusing to stay longer on the ground that he was quite able to do his ordinary work.

Case 3. Bhagan Bibi: female Mohammedan; aged 35:

came in on March 3rd with a very irritable and inflamed condition of the eyes, with typical "ptosis". On everting the upper lids they were found to be partly gelatinous and partly cicatrised, with numerous large fatty granulations embedded in the gelatinous material; the contents of these were very easily squeezed out by ordinary pressure on the lid, in one case shooting out like the plug of a comedo with a thread nearly half an inch in length. The patient

can hardly open her eyes. On the 5th numerous granulations were gently expressed with forceps and the hypertrophied parts of the conjunctiva touched with the strong silver lotion. Two days later the eyes were much quieter and cleaner than before, the corneae which had been slightly hazy, became somewhat clearer. Ordinary astringent lotions were used till the 9th, when the patient left Hospital expressing herself quite satisfied, able to get about easily and with practically no discharge or irritability. There are still granulations left which can be squeezed out on everting the lids.

Case 4. Isa; male Mohammedan; aged 35: admitted on November 4th with considerable photophobia and spasm, both corneae are very vascular and there is marked circumcorneal injection. The conjunctiva of the upper lids presents a variegated pattern, showing in parts a spongy condition with old fatty granulation embedded in it, and in parts, especially at the upper margin of the cartilages, islands of bluish gelatinous thickening. On the 5th a subconjunctival injection of salt sol (20 minims) was given into each eye: with this and ordinary treatment there was no marked change in the corneal condition. On the 13th 60 grs. silver lotion was carefully applied to the lids: on the 16th the congestion had decreased and the corneae were clearer and the silver lotion

was again applied. On the 19th, the patient left Hospital, both conjunctivae and corneae being very decidedly improved in condition.

Case 5. Narayan Das; male Hindu; aged 30: admitted on November 1st with extreme photophobia and blepharospasm. The conjunctiva of right upper lid is covered with fine scar lines, accompanied with sponginess and swelling of the fornix. In the left eye there is diffuse keratitis with a small shallow central ulcer with grey infiltrated floor: the conjunctiva is as in right eye but the swelling of the fornix is more marked and is present also, in less degree, in lower lid. There is no trichiasis. On the same day under C.H.Cl₃ the ulcer was touched with the actual cautery, being displayed by Fluorescin: both fornices were carefully swabbed with the strong silver lotion, Atropin instilled and the eye bound up. Up to the 17th an ointment containing Atropin and Dionin was daily inserted, and the improvement was steady and decided though slow: on that date, and again on the 22nd, the silver lotion was re-applied, the patient complaining of great pain after the second of these applications, which, however, had disappeared by next morning. The ointment was kept up regularly and the silver lotion applied again on the 1st of December. By this time the condition was vastly improved and

the ulcer quite healed. On the 12th the silver was again applied at the patient's own request, and he went out the following day expressing himself as highly delighted with his condition: for months before coming in he had been able to do nothing but sit on his bed with his head muffled up, suffering continuous pain. The eyes open freely and are almost free of congestion though the fornices are still spongy to some extent: there is a nebula on the left cornea but all circumcorneal injection has gone and the right eye is absolutely clear.

Case 6. Sarashti; female Hindu; aged 20: admitted on April 28th complaining of having had trouble in her eyes for 2 years. Eighteen months ago she was operated on for trichiasis in another Hospital: there is no trichiasis, but the lids have been so much shortened that they barely meet. The conjunctiva of right upper lid is thick and typically gelatinous with a few deep small yellow granulations embedded in it: in the left eye the conjunctiva of both lids is thick and spongy with a considerable number of projecting frog-spawn granulations. On the 29th, under Chloroform, Grady's forceps were applied to both lids of left eye and strong silver lotion swabbed over both lids of both eyes. Next day the lids appeared slightly red and swollen, and there was a

good deal of discharge. Weak Protargol lotion was instilled up to the 3rd of May when copper (Lapis Divinus) was begun and on the 10th the patient left Hospital much relieved. On October 16th she was re-admitted, when the conjunctiva of the right eye was still gelatinous but with fine strands of cicatrization beginning to appear. In the left eye the condition was now that of a groundwork of gelatinous thickening with a number of small protruding granulations: to this lid Grady's forceps were used and silver applied to the conjunctiva of both lids as before. On the 20th she left the Hospital, the note being, "Conjunctiva a good deal less swollen, no projecting granulations, no irritation, no discharge".

Case 7. Fatteh Bibi: female Mohammedan; aged 40:

admitted October 23rd: both upper lids covered with small salt grain like granulations projecting from a thickened and somewhat gelatinous conjunctiva: both corneae hazy all over. On the 24th numerous granulations were expressed with Grady's forceps and 60 grain silver lotion applied. Patient left on the 26th with the conjunctivae smooth and with no irritability of the eyes, though there was still some discharge.

Case 8. Zan^uia^h Bibi: female Mohammedan; aged 15:

admitted October 29th. The only external abnormality is a slightly heavy look about the eyes: no

discharge or irritability. On examination the conjunctiva of all four lids is found spongy, with thick flabby folds in fornices and numerous flat whitish granulations slightly raised above the surface chiefly in right lower lid and fornix of right upper lid. Grady's forceps were used and while a considerable number of granulations were easily expressed, almost as many proved too resistant: both lids and fornices were thoroughly swabbed with strong silver lotion, after which a weak Protargol lotion was used daily up to the 9th when the patient left with "conjunctiva much smoother, no congestion or secretion."

Case 9. Muhammed Din, male Mohammedan; aged 35; admitted on November 30th: nothing noticeable externally except heaviness and thickening of edges of lids. On eversion the whole conjunctiva of both upper lids found enormously hypertrophied and of a curious buff colour, gelatinous with many fatty granulations embedded and a few projecting "sago grains": the conjunctiva of lower lid spongy: cornea and palpebral conjunctiva absolutely clear and free from any signs of inflammation. Both upper lids were thoroughly treated with Grady's forceps and many granulations easily expressed especially on the right side: strong silver lotion was applied to both upper and lower lids. Daily

treatment was continued with Protargol lotion till the 13th when the patient left, satisfied with the improvement, the conjunctivæ being quite smooth and the eyes comfortable.

Case 10. Karim, male Mohammedan, aged 10: admitted November 3rd with considerable blepharospasm and congestion of both eyes: the conjunctiva of both upper lids spongy with small red projecting granulations in upper part and fornix: flat pale granulations in both lower lids. For six days treatment with astringents was carried on, and on the 9th, under chloroform, a large number of granulations were expressed from upper lids with Grady forceps: those in lower lids proved resistant: silver lotion applied. Patient left Hospital on the 11th with the conjunctiva distinctly smoother and with the congestion and spasm markedly relieved.

Case 11. Muhammed Din, male Mohanmedan; aged 15; admitted on November 5th: the right upper lid is heavy and thick, the whole cornea vascular and hazy, resembling interstitial keratitis: cornea of left eye quite clear and eye looks normal. The conjunctiva of both right lids found enormously swollen, gelatinous and fleshy overgrowth mingled, with several deep cracks in the mass: in the left eye the conjunctiva is spongy. On the 6th a sub-conjunctival injection of salt solution was given

into the right eye, but its effect on the corneal condition seemed to be nil. On the 10th strong silver lotion was applied to all lids and repeated on the 16th: the patient left on the 19th refusing further treatment.

Case 12. Rasul Bibi, female Mohammedan; aged 30: admitted on November 13th with diffuse vascularity of whole of right cornea: bulbar conjunctiva slightly congested: palpebral conjunctiva scarred and much contracted, with slight sponginess in spots but with no granulations visible. Sub-conjunctival injections were given on the 13th and 22nd with general treatment in the interval: on the 23rd the patient left with the cornea distinctly clearer.

Case 13. Sarashti, female Hindu, aged 20: admitted with both corneae diffusely infiltrated and vascular, with considerable conjunctival redness and irritability of the eye: the palpebral conjunctiva of both eyes replaced by silky smooth cicatricial tissue, with slight sponginess left in the fornices: the cartilages are bent but there is no actual trichiasis. A sub-conjunctival injection was given, followed by general treatment, but patient left at the end of a week dissatisfied with the absence of improvement.

Case 14. Beli Ram, male Hindu, aged 40: admitted on October 5th with marked entropion and trichiasis

of both upper lids, the right lower lid being ectropic with a granuloma the size of a pea growing from its surface. The conjunctiva of both upper lids markedly spongy and congested and both corneae vascularised all over. On the 6th, under chloroform, strong silver lotion was applied and the granuloma snipped off: by the 12th the general condition was much improved and Arlt's operation was done on both eyes. Ten days later the patient left Hospital highly delighted with his condition: the trichiasis is quite relieved, the lids well healed, the conjunctival congestion and thickening considerably reduced, and the corneae clearing.

To the eye surgeon in North India perhaps the chief interest and importance of trachoma lies in its bearing on operations for Cataract. This manifests itself in various ways. There is, for example, the eye with active Trachoma, for which, however, the patient does not present himself and for which he will not consent to undergo treatment unless his vision is to be restored to him at once by a removal of the accompanying cataract. The problem is a very real and a very puzzling one. Of Czermak's operation, which might save the situation in some of these cases, the writer has had no personal experience. It is interesting to note, however, that Elschnig, Editor of the second edition of Czermak's textbook, states that "septic

infection of the wound is just as frequent after sub-conjunctival as after ordinary extraction" (v. B.M.F.J. Dec. 4, 1909, p. 1619). Next come cases in which the Trachoma has reached its later stages and the conjunctiva is largely cicatrised and shrunken and the cornea hopelessly injured: the cataract may be removed with complete success, but vision can never be aught but poor. A further stage is seen with actual entropion and trichiasis complicating the cataract: in some cases the patient will accept an operation for the former and return for the extraction of the latter, but in others no powers of persuasion are sufficient to enable him to understand the situation, and in such cases, especially when he has come perhaps from some remote hilly district involving a journey he will never be able to undertake again, there is nothing for it but to do an operation in the hope of securing at least partial success. Equally troublesome and more disappointing are those cases in which there is a degree of entropion but no actual trichiasis which however develops after a few days of bandaging: the edge of the lid swells and the hair line turns inward, causing irritation and vascularity of the wound and upper part of the cornea. The eye surgery of the Punjab is practically all done during two months in autumn and two in spring: it is an ingrained conviction that October, November, March and April are the time for this purpose, and the Hospitals conse-

quently become seriously overcrowded. (In April 1909, for example, the number of inpatients in this Hospital, built for 40 beds, rose to 166, the great majority being eye cases.) In the rush of work it is difficult to examine and note the condition of every eye carefully, and cases of partial or incipient entropion are easily overlooked, especially when cutting of the eyelashes is a routine preliminary to operation. In another class of case the contraction of the conjunctiva has caused a very deficient palpebral aperture, rendering a good incision very difficult, while in some the obliteration of the sac results in a very insecure hold for the speculum which tends constantly to slip out.

The prognosis in many of these cases as regards vision is very dubious or even bad, and it is only the absolute helplessness of the patients that induces one to operate at all: the majority are amply satisfied with an amount of vision sufficient to enable them to grope their way about and to go out unattended morning and evening to perform the necessary functions of nature. In many the prognosis as regards the operation itself is bad, both from the difficulty of securing a good incision and of avoiding sepsis.

The following notes illustrate these various difficulties and the results accruing from them. They are taken from among the records of ⁴⁴²~~over 450~~ cataract extractions performed by the writer during 1909. The first series contains some typical cases of trachomatous

conditions complicating cataract in which the operation may be classed as more or less successful, vision ranging from poor up to good, but being probably in most cases as good as could reasonably be expected.

It is the writer's practice to aim at a corneo-sclerotic incision: for convenience in recording, " $\frac{3}{4}$ cornea" = an incision emerging in the cornea $\frac{3}{4}$ of the distance above the equator; MM. & M.F. = Moham- medan male and female; H.M. & H.F. = Hindu male and female.

Case 1. Piran Ditta; M.M. 35; admitted 5th March 1909; old trachoma; no discharge; cornea hazy and a little vascular in upper part; operation 6th March 1909; incision $\frac{3}{4}$ cornea; much gelatinous cortex; progress uneventful; left 13th March 1909, pupil apparently clear, but difficult to see owing to corneal haziness; counts fingers at 4 feet; + 10 D at 6 feet.

Case 2. Umr Bibi; M.F. 60; admitted 5th March 1909; considerable blepharitis and chronic congestion of conjunctiva; sac contracted; stringy mucus; cornea hazy. Treated with astringents and boric ointment on lids up to 11th March; eye well irrigated with 1 in 4000 Binioidide lotion before operation; lens delivered intact by Smith's method. Left 19th March; counts fingers at 6 feet.

Case 3. Sharf Din; M.M. 65; admitted 29th March 1909; old trachoma with marked ~~sc~~^xerosis of conjunctiva; also a pterygium; cornea hazy all over but clearer in upper part. Operation 30th March, preceded by Biniiodide irrigation (1 in 4000); incision very difficult owing to conjunctival contraction, speculum repeatedly slipped out; lens expressed by Smith's method with a very small loss of vitreous after it. Left 7th April; the whole cornea rather vascular with considerable congestion; coloboma difficult to see; counts fingers at 3 feet.

Case 4. Sharf Bibi; M.F. 70; admitted 24th April 1909; conjunctiva congested and spongy with mucous secretion; tendency to entropion of upper lid; small palpebral aperture. Irrigation with Biniiodide lotion and operation on ^{3/5/09} ~~4~~; incision downwards; corneo-sclerotic. Progress uneventful except for some spastic entropion of lower lid which passed off; left 12/5; counts fingers at 8 feet; +10 D at 12 feet.

Case 5. Zaniaⁱ~~h~~^b Bibi; M.F. 50; admitted 13th March 1909; cicatrised conjunctiva; cornea hazy and vascular in upper part. Operation 15th March with preliminary irrigation with Biniiodide lotion; incision $\frac{3}{4}$ cornea; a good deal of bleeding from cornea; lens expressed easily by Smith's method; some blood in anterior chamber left. Up to the 19th a fair amount

of discharge on dressing with swelling of lid and some pain: thenceforward uneventful, except that trichiasis of upper lid developed: several hairs removed: left 24/3: good coloboma but cornea still somewhat vascular: counts fingers + 10 D at 8 ft.

Case 6. Chughatta: M.M.: 40: admitted 6th April 1909: congested spongy conjunctiva: diffuse haziness of cornea with dense leucoma below pupil. Operated on the same day with preliminary Binioidide irrigation. A preliminary iridectomy had been done downwards and inwards in another hospital: incision, corneo-schlerotic downwards: much soft cortex. On the 10th a tendency to entropion of upper lid noted but trichiasis did not develop. Left Hospital 17th April able to count fingers at 8 ft. + 10 D at 12 ft.

Case 7. Bhari: M.F.: 50: admitted 29th March 1909: conjunctiva cicatrised and palpebral aperture small: a good deal of watery discharge: Operation 30th March after Binioidide irrigation: incision $\frac{3}{4}$ cornea: lens expressed by Smith's method: progress uneventful: left Hospital 7th April, wound still pretty vascular and cornea dim in upper part: counts fingers at 6 ft: + 10 D at 18 ft. Seen again on 10th May 1909: no vascularity but cornea still cloudy in upper part: + 10 D counts fingers at 38 ft. easily.

Case 8. Hayat Bibi: M.F.: 50: admitted 27th March 1909

conjunctiva smooth cicatricial: old pannus upper half of cornea: Operation 28th March after Biniodide irrigation: incision $\frac{3}{4}$ cornea, difficult owing to deep orbit. Left 5th April with considerable vascularity of wound and some unabsorbed cortex left in upper part of coloboma. Counts fingers at 10 ft.: + 10 D at 16 ft.

Case 9. Thari: M.F.: 65: admitted 22nd March 1909:

tendency to entropion of upper lid: mucous stringy secretion: palpebral aperture very small. Operation 23rd March: incision corneo-sclerotic downwards vitreous lost in trying to express by Smith's method: lens removed intact with vectis with no further loss. At the first dressing on the 25th there was spasm with entropion of upper lid: on the 28th hairs were removed: on the 30th a sty was incised on lower lid. On the 2nd April patient left with still some irritability of eye: counts fingers at 10 ft.

Case 10. Hamrai: H.F.: 70: admitted 20th March 1909:

conjunctiva spongy, slight entropion, conjunctival sac much contracted and palpebral aperture very small. Operation on 22nd March after Biniodide irrigation: Corneo-sclerotic incision downwards: failed to deliver by Smith's method vitreous appearing but not lost: lens removed intact with vectis. Dressed 23rd March: complaining of considerable pain:

swelling of lid and watery blood stained discharge on dressing: pain and discharge ceased by next day, but lid still swollen. Left on 29th March able to count fingers + 10 D at 8 ft.

Case 11. Gulaba: M.M.: 65: admitted 29th September 1909:

conjunctiva spongy with some sticky mucous secretion: treated with Protargol up to 4th October when operated on: incision corneo-sclerotic downwards to avoid contact with lid: left 14th October: counts fingers at 15 ft. with + 10 D.

Case 12. Niamat Bibi: M.F.: 45: admitted 29th October

1909: slight tendency to entropion of upper lid: conjunctiva spongy and congested: treated with Protargol up to 1st November: incision $\frac{4}{5}$ cornea: lens expressed by Smith's method with a small loss of vitreous. Left on 9th November able to count fingers at 8 ft.: + 10 D at 36 ft.

Case 13. Mir Bibi: M.F.: 60: admitted 7th November

1909: contracted conjunctiva and small palpebral aperture: watery discharge: operated on 9th November: incision $\frac{4}{5}$ cornea, difficult owing to lack of space: lens expressed by Smith's method: convalescence rather troublesome: on 11th November at first dressing muco-purulent discharge on dressing and a yellowish deposit along wound: wound is closed and there is a bubble of air in anterior chamber: by the

13th wound had cleared but a good deal of lachrymation and spasm continued till patient left on 20th November with wound somewhat vascular: Counts fingers at 2 ft. but is very stupid and makes no attempt to see.

In the following four cases sepsis of the wound occurred and the operation ended in total failure.

1. Bhagani: M.F.: 55: admitted 11th November 1909: conjunctiva cicatricial and contracted with very small aperture: cornea hazy in lower part. Operation 12th November: incision extremely difficult, $\frac{1}{2}$ cornea and knife had to be brought out under the lid: lens expressed by Smith's method but the capsule ruptured. First dressing 14th November; no pain but purulent discharge on dressing: 15th November purulent discharge distinctly less: lower part of cornea very cloudy: no pain: 16th November lid much swollen, pain, but very little discharge: 17th November lid still more swollen: from thence onwards the ordinary course of pan-ophthalmitis.
2. Raj^Bhari: M.F.: 60: admitted 8th October 1909: conjunctiva congested, spongy and also cicatrised: aperture small: operation 9th October: incision $\frac{3}{4}$ cornea downwards: nothing unusual till 13th October when lids were swollen, muco-purulent discharge on dressing and line of incision infiltrated: Treatment was kept up with an Iodoform and Atropin oint-

ment and sepsis was confined to the cornea and anterior chamber: patient left Hospital 20th October.

3. Amir Singh: H.M.: 65: admitted 24th March 1909: has been operated on previously in this Hospital for entropion - result is quite satisfactory: after irrigation with Biniodide lotion operation was done on 26th March: incision $\frac{3}{4}$ cornea and very difficult owing to lack of space and speculum slipping out: iridectomy done with incision: immediately after patient squeezed out lens intact with some vitreous: the lid was carefully raised and the corneal flap replaced in good position without any further loss of vitreous: first dressing on 28th March: pain in whole head, muco-purulent discharge on dressing: the same evening there was only slight discharge. The condition progressed steadily till whole cornea was infiltrated with purulent matter which, however, did not result in panophthalmitis: Left Hospital 14th April with cornea opaque: no conjunctival swelling or discharge remaining.
4. Ganhar Bibi: M.F.: 45: admitted 6th March 1909: old trachoma: palpebral aperture small: formerly operated on for entropion here, result quite satisfactory: cornea hazy and somewhat vascular. Operation 8th March after Biniodide irrigation: incision $\frac{3}{4}$ cornea with considerable bleeding: dressed on 10th March, some purulent discharge, no pain: great pain however that evening. On 11th March the wound

and cornea below infiltrated with pus: On 12th March swelling of upper lid was very marked: Left Hospital on 18th March with following note "central and upper parts of cornea filled with yellow purulent infiltration: very little conjunctival discharge or swelling".

The last two cases illustrate failure even after a perfectly satisfactory preliminary operation for the entropion. Those following are examples showing a successful result in like circumstances.

1. ^M ⁶ Rahtak Bibi: M.F.: 45: admitted 11th November 1909: operated on 2 years ago for entropion, good result: cornea shows many small nebulae chiefly in lower part. Operation 12th November: incision $\frac{3}{4}$ cornea, difficult owing to small aperture: lens expressed by Smith's method: left on 21st November, cornea still slightly vascular in region of wound which itself is almost invisible. Counts fingers at 2 ft. and + 10 D at 6 ft., but makes no effort. Seen again on 16th December, no congestion or irritation: counts fingers at 10 ft.
2. Jamna Dai: H.F.: 60: admitted 9th November 1909: entropion operated on in spring, very good result: a good deal of watering: cornea hazy and faceted: Operation 10th November: incision corneo-sclerotic difficult owing to small aperture and slipping out of speculum: lens delivered by Smith's method. Left

on 20th November, slight vascularity of wound: counts fingers at 10 ft.: + 10 D at 21 ft. Seen again 15th December: no vascularity: counts fingers at 24 ft.

3. Gomman, H.F.: 50: admitted 4th November 1909: previously operated on for entropion, good result: cornea shows a leucoma on central and inner part which is partly staphylomatous, rest of cornea also slightly hazy. As in many of these cases the other eye is hopelessly blind, in this instance being atrophied. Operation 9th November: incision corneo-sclerotic downwards: lens expressed by Smith's method: progress uneventful: left 23rd November, wound still pretty vascular: counts fingers at 8 ft.

The following two records illustrate (1) the hopeless outlook in some of these cases, where, however, one is forced to operate on the bare chance of giving some vision, however small; and (2) some of the practical difficulties that arise in patients who seem to comprise in themselves nearly all the undesirable elements for operation.

1. Lachmani: H.F.: 45: admitted 19th April 1909: the left eye shows a hypermature lens dislocated into the anterior chamber, no vision: in the right eye projection of light is good, but cornea is very cloudy all over. Arlt's Operation was done on both eyes on 17th March 1909 and the result is perfectly

satisfactory, but there is a tendency in the right lower lid to roll inwards. The incision was $\frac{3}{4}$ cornea and difficult owing to small aperture: capsulotomy was done and a good deal of soft cortex removed after the nucleus: the pupil seems to be clear, but it is impossible to be certain owing to corneal condition. By the 30th April the wound was sound and flat but there was no useful vision as the whole cornea was cloudy.

2. Ilah Bibi: M.F.: 60: admitted 10th November 1909. Was operated on here in spring for entropion, good result: lower lid turns in, a good deal of watering: cornea hazy and faceted. Hairs removed from lower lid before operation: incision extremely difficult, the notes made at the time being - "very small palpebral aperture exposing only central part of cornea: patient winces at slightest touch even on face: incision $\frac{1}{2}$ cornea downwards without seizing with fixation forceps". Capsulotomy was done and a good deal of curdy cortex removed after the nucleus: the pupil seems clear. Atropin was instilled three times at intervals of five minutes before bandaging. On the 13th swelling of the upper lid was noted: Atropin twice a day was carried on regularly: on the 14th the cornea could be examined and was found cloudy especially round the wound. On the 26th the patient left Hospital without leave and without being examined. Vision, if any, was probably very

satisfactory, but there is a tendency in the right lower lid to roll inwards. The incision was $\frac{3}{4}$ cornea and difficult owing to small aperture: capsulotomy was done and a good deal of soft cortex removed after the nucleus: the pupil seems to be clear, but it is impossible to be certain owing to corneal condition. By the 30th April the wound was sound and flat but there was no useful vision as the whole cornea was cloudy.

2. Ilah Bibi: M.F.: 60: admitted 10th November 1909. Was operated on here in spring for entropion, good result: lower lid turns in, a good deal of watering: cornea hazy and faceted. Hairs removed from lower lid before operation: incision extremely difficult, the notes made at the time being - "very small palpebral aperture exposing only central part of cornea: patient winces at slightest touch even on face: incision $\frac{1}{2}$ cornea downwards without seizing with fixation forceps". Capsulotomy was done and a good deal of curdy cortex removed after the nucleus: the pupil seems clear. Atropin was instilled three times at intervals of five minutes before bandaging. On the 13th swelling of the upper lid was noted: Atropin twice a day was carried on regularly: on the 14th the cornea could be examined and was found cloudy especially round the wound. On the 26th the patient left Hospital without leave and without being examined. Vision, if any, was probably very

poor as the cornea was not clearing at all well.

In the following cases Arlt's Operation was performed during the convalescence after cataract extraction: in the first three the condition of the lid was noted, in the other two apparently not so, as there is no record made on their charts.

1. Matthra Dai: H.F.: 60: admitted 26th March 1909: left eye operated on for cataract in another Hospital: no vision, secondary cataract: in the right eye the lens capsule presents calcareous thickening: Some trichiasis of upper lid: unhealthy flabby conjunctiva with mucous secretion: cornea dim and vascular especially in upper part. It is noted on the chart that the "operation is done only because the patient insists". Projection is recorded as "only fair". Incision downwards as cornea better below and also to avoid hairs: lens expressed easily by Smith's method. On the 29th the lid was swollen and tending to turn in and this was more marked on 31st. On 5th April Arlt's Operation was done with slitting of the outer canthus. On the 12th the patient left with the note "whole cornea hazy; entropion quite relieved: counts fingers at 3 ft."

2. Fazl Bibi: M.F.: 50: admitted 21st October 1909: slight entropion of upper lid, pterygium at inner side: diffuse hazy opacity over pupil. The other eye is atrophied. Operation 21st October: incision corneo-sclerotic upwards: on 26th October considerable

conjunctival discharge and irritation owing to Entropion: 29th October Arlt's Operation: 5th November left Hospital, "coloboma clear, good result of Arlt's Operation, good vision".

3. Fazl Bibi: M.F.: 60: admitted 27th March 1909: left eye, conjunctiva spongy with some trichiasis at outer end: right eye, marked entropion and cataract: left eye operated on: $\frac{4}{5}$ incision: much soft cortex after nucleus: 30th November some cortex in pupil: considerable irritation persisted till 12th April when Arlt's Operation with cantho-plasty was done: left on 17th April with very little irritation remaining: fragment of unabsorbed cortex at one side of pupil: counts fingers at 8 ft.: + 10 D. at 27 ft.
4. Narayan Dai: H.F.: 65: admitted 29th March 1909: conjunctiva spongy and congested: round rather prominent leucoma just above pupil: Operation 29th March: incision corneo-sclerotic downwards: lens expressed by Smith's method. At first dressing on 31st March tendency to entropion of upper lid noted: hairs removed on 4th and 7th: Arlt's Operation on 15th: left Hospital 20th April "good result of Arlt's Operation, cornea much clearer and irritation much less: + 10 D counts fingers at 12 ft." Seen again on 17th May: still a little redness and irritation: results of Arlt's Operation very good: vision as before.
5. Bhayan Dai: H.F.: 50: the only abnormalities noted are haziness in lower part of cornea and a bad smell

from the nose. Operation 1st November: incision $\frac{3}{4}$ cornea: lens delivered in capsule: on 3rd November slight discharge on dressing, good deal of watering, cornea very cloudy: from 4th to 8th there was pain and watering and on the 9th entropion of upper lid was noted: On 16th November Arlt's Operation was done with slitting of outer canthus: patient left on 24th November with still some haziness in upper part of cornea and some lachrymation: no trichiasis: counts fingers at 6 ft.: +10 D at 12 ft.

(At this point a note may be permitted regarding "Smith's Operation" mentioned in a number of the records given. There seems to be considerable misunderstanding regarding this method of removing the lens in the capsule. Mere removal of the lens in its capsule is not Smith's Operation: that was practised long before Smith's day. The special points in his method (and how completely they revolutionise the procedure can only be understood when it is carried out in its complete form as taught and practised by Smith) consist in the forcible elevation ^(not towards the brow, but "forwards" anatomically) of the upper lid and eyebrow with a hook or other instrument and the hand, the forcible depression of the lower lid with the finger or thumb, and the peculiar technique employed in expressing the lens. This, however, is not the place to go into these matters.)

As regards the treatment of Entropion and Trichiasis

arising from Trachoma all that the writer has to say has been already said. How common these conditions are may be judged from the fact that in the years 1907-9, inclusive, 609 operations for them have been performed in this Hospital, the total number of eye operations recorded in the same period being 1824. Notes more or less complete have been kept of most of them, and though the great majority have been sent out as "cured", that verdict, for reasons stated above and from the impossibility of following up cases, cannot be taken as final. The usual method followed has been that of Arlt, in which the writer would again affirm his faith: in cases specially suitable Snellen's operation has been performed, but these have been few in number compared to the others.

The following notes of 50 cases, taken in almost every instance by the writer himself, are selected from the record files not so much with the view of throwing any light on the operation itself but rather as a commentary on what has previously been said regarding the clinical features and history of Trachoma. They especially emphasise the "mixed" character of the great majority of cases even when they have advanced to a degree of cicatrisation sufficient to lead to well marked Entropion and Trichiasis.

1. Gul Muhammed: M.M.: 35: lids of both eyes much excoriated with a good deal of blepharospasm: Upper lids markedly curved with thick spongy and cicatrised

conjunctiva with a few large fatty spots: cartilages small and soft. Arlt's Operation both eyes with slitting of canthi: very good result: no spasm and very little congestion: hairs in good position.

2. Daya Ram: H.M.: 65: marked entropion in both upper lids but only a few hairs down in each eye: conjunctiva largely cicatrised, parts velvety: cartilages large and soft and markedly curved: left cornea fairly clear: ripe cataract: right cornea rather hazy with small pterygium at inner side. Arlt's operation both eyes: very good results.

3. Zⁱan^h Bibi: M.F.: 35: extreme dryness of lower part of conjunctiva and cornea in right eye: marked entropion and blepharospasm: conjunctiva nearly all cicatrised and smooth: cartilage small and markedly curved: in left eye diffuse keratitis with cornea and lid as in right: entropion of both lower lids. Arlt's Operation in both upper lids with cantho-plasty, and plastic operation in lower lids: good result in all lids.

4. G^urijari: M.F.: 35: marked entropion in left eye, all lashes sweeping the globe: conjunctiva congested and cicatrised: leucoma on cornea but no keratitis: cartilage soft and small: condition of right eye not noted, hence probably fairly normal: Arlt's Operation with slitting of canthus: very good result.

5. Bhage: M.F.: 50: ^sscerosis of both corneae: small palpebral apertures and marked entropion with small

- cartilages and very contracted conjunctival sacs. Arlt's Operation both eyes with slitting of external canthi: operation difficult owing to obliteration of fornices. Good result except that at inner end of left lid a few hairs are somewhat down.
6. Jawahir Bibi: M.F.: 40: Marked entropion in both eyes with very fine hairs: edge of lid completely bevelled: old fatty granulations: cartilages thin and soft. Arlt's Operation both eyes: some hairs a little down at outer end of both lids: otherwise good result.
7. Umra: M.M.: 35: trichiasis in central part of both upper lids: cartilages thick and hard: old fatty granulations: soft flabby conjunctiva. Arlt's Operation both eyes: some hairs a little down at inner end of right lid, otherwise good result.
8. Imam Din: M.M.: 40: left eye formerly operated on here: good result but cornea is very cloudy: marked entropion in right eye, cartilage very atrophic and small. Arlt's operation: lid still a good deal swollen when discharged but result good.
9. Bhagani: M.F.: 25: both eyes cataractous: right eye - marked entropion with thick gelatinous conjunctiva and old fatty granulations: same condition but less marked in left eye. Arlt's Operation both eyes: good result.
10. Ganhar Bibi: M.F.: 30: marked entropion in both

eyes with thickened cartilages: diffuse opacity of right cornea with "absorption ulcer" on it: left cornea entirely opaque: fatty granulations and flabby conjunctiva in both eyes. Arlt's Operation both eyes: good result.

11. Jiwan Dai: H.F.: 50: Entropion in both eyes, cartilages thick and curved, small palpebral apertures. Arlt's Operation both eyes with slitting of canthi: good result.

12. Bakhtawar Bibi: M.F.: 50: marked Entropion both eyes: conjunctiva spongy and cicatrised: cornea clear. Arlt's operation both eyes: good result.

13. Begam: M.F.: 50: left globe atrophied: entropion right eye, marked cloudiness of cornea, conjunctiva cicatrised. Arlt's Operation: a good deal of swelling of lid on leaving, but good result.

14. Jallo: M.F.: 20: marked entropion in both eyes with long lashes, much blepharospasm, small palpebral aperture, conjunctiva cicatrised, cartilages thick. Arlt's Operation and canthoplasty both eyes: on leaving still a good deal of discharge but eyes open easily and vision is good: in right eye hairs a little down at both ends of incision.

15. Ibrahim: M.M.: 50: gelatinous thick conjunctiva in both eyes with fatty granulations: marked curving of tarsi; small palpebral aperture, spasm. Arlt's Operation both eyes with slitting of canthus in right: good result.

16. Nabi Bakbsh: M.M.: 35: marked entropion on both sides with spasm: small palpebral apertures: conjunctiva very rough and granular. Arlt's Operation both eyes: still some swelling of lids and discharge on leaving but eyes open easily: hairs a little down at outer end of right lid.
17. Ahmad Din: M.M.: 8: trachoma in both eyes with gelatinous thick conjunctiva and small deep granulations: marked trichiasis in outer half of right upper lid: beginning in centre of left: spasm: discharge: cornea clear. Arlt's Operation right eye with slitting of canthus: St. Mark's Hospital Operation in left eye with graft from lip: very good result both eyes.
18. Nihal Dai: H.F.: 25: entropion in both eyes: cartilages soft and small, conjunctiva spongy in parts with degenerated yellow granulations and irregular cicatrisation. Arlt's Operation both eyes: good result in right: some doubtful hairs at middle of left lid.
19. Jalal: M.M.: 35: marked trichiasis but not much curving of cartilage in right eye: conjunctiva spongy and cicatrised with fatty granulations: left eye healthy. Arlt's Operation: good result.
20. Begam: M.F.: 50: Entropion in both eyes with excoriated lid margins and spasm: soft thin cartilages with flabby congested conjunctiva and old fatty granulations. Arlt's Operation both eyes: good result.

21. Lakhmi: H.F.: 45: a few lashes displaced in both lids in both eyes: moderate curving of cartilages: conjunctiva cicatricial in ~~old~~^{all} lids with slight sponginess and a few fatty granulations: cicatricial line particularly well seen in right lower lid. Arlt's Operation on both eyes with sutures in lower lids: good result in all.
22. Rukman Dai: H.F.: 35: marked trichiasis inner half of right upper lid: spasm and excoriation of lid margins on both sides. Arlt's Operation with slitting of canthus in right eye: canthoplasty in left: good result.
23. Imam Bibi: M.F.: 50: Entropion of both eyes with spasm: small hard cartilages: conjunctiva cicatricial and spongy. Arlt's Operation both eyes: good result.
24. Hayat: M.M.: 20: moderate entropion in both eyes especially at outer ends: cartilages small and conjunctivae cicatrised. Arlt's Operation both eyes: good result in right, not very good in left eye.
25. Bholi: M.F.: 60: marked entropion in both eyes with much spasm and small apertures with excoriated lid margins: cartilages large and hard: conjunctiva gelatinous with old fatty granulations. Arlt's Operation both eyes with slitting of canthi: difficulty in freeing the cartilage in right eye: good result in both eyes except that one or two hairs are a little down at inner end in left eye.

26. Rasāl Bibi: M.F.: 6: marked entropion in both eyes with blepharitis and spasm: conjunctiva in both thick and gelatinous with commencing cicatrisation: cartilages small and soft. Arlt's Operation both eyes: good result. Seen three weeks later: small nebula on lower part of right cornea: lid in excellent condition: in left eye the lid is still a good deal swollen and inflamed: cornea clear.
27. Bhagan Bibi: M.F.: 30: marked entropion in both eyes with much spasm: conjunctiva gelatinous with small deep glassy looking granulations. Arlt's Operation both eyes: good result.
28. Ganesh Dai: H.F.: 35: trichiasis in both eyes but not much curvature of cartilages: conjunctiva largely cicatrised with old granulations. Arlt's Operation both eyes and very good result.
29. Bhagwanti, H.F.: 30: sister of 28: Marked entropion in both eyes with curved cartilages and long hairs sweeping the globe: conjunctiva diffuse gelatinous beginning to be cicatrised with a few fatty granulations: palpebral aperture small in left eye: both corneae hazy. Arlt's Operation both eyes with slitting of canthus in left: next day a good deal of bleeding from right eye: discharged with good result in both eyes.
30. Muhammad: M.M.: 35: a few hairs only down on both sides at centre of lids: conjunctiva cicatricial and gelatinous with fatty granulations: marked curvature

of cartilages: both corneae show nebulae and opacities: considerable congestion of bulbar conjunctiva with circumcorneal injection: the left cornea slightly coloured by Fluorescein - probably very suprafacial ulceration. Arlt's Operation on both eyes: Atropin: left with some swelling of lids but very good result otherwise.

31. ^Q Radir Bakash: M.M.: 30: left globe atrophied: marked entropion in right eye: cartilage small and soft: cicatricial conjunctiva with a few frog-spawn granulations: cornea shows diffuse opacity. Arlt's Operation after expression of granulations by Grady's forceps: good result.

32. Chandu Mall: H.M.: 65: marked entropion in both eyes: conjunctiva of both upper lids shows young and old degenerated granulations, papillary swelling and cicatrisation mingled: cartilages thick, knobby, hard and curved: both corneae very cloudy all over, but not vascular. Arlt's Operation both eyes: good result.

33. Mahr Dad: M.M.: 60: left cornea entirely opaque: right partly so but there is fair vision: conjunctiva cicatrised with a few degenerated granulations: cartilage thick and markedly curved. Arlt's Operation: good result. Seen again 8 weeks later: granuloma growing from middle of lid margin, otherwise good result: granuloma snipped off and touched with copper.

34. Takhmani: H.F.: 50: entropion both eyes: old fatty granulations in cicatrised conjunctiva: soft small

cartilages: lower lid of right eye also turned in: cornea of right eye shows diffuse opacity: that of left eye clear, but lens is cataractous, hypermature and subluxated. Arlt's Operation both eyes: Plastic Operation lower lid right eye: good result in all.

35. Imam Bibi: M.F.: 35: conjunctiva very congested and spongy in both eyes: in the right eye an inner row of hairs rubbing on cornea, in left eye a few at outer end of lid: both corneae clear. Arlt's Operation both eyes: good result.
36. Jamna Dai: H.F.: 50: marked entropion in both eyes: cartilages small and atrophied: palpebral apertures small: conjunctiva spongy and partly cicatrised: both corneae very cloudy. Arlt' Operation both eyes with slitting of canthi: good result.
37. Buddhi: M.F.: 45: marked Entropion and blepharospasm in both eyes: whole line of lashes sweeping globe: conjunctiva spongy and cicatrised: cartilages small, soft and markedly curved: diffuse keratitis both corneae. Arlt's Operation with canthoplasty in both eyes: good result in right; not very good in left, hairs at both ends tending downwards.
38. Nabhu: M.M.: 40: left globe atrophied: in right eye central corneal opacity with a conjunctival phlyctenule on lower limbus: thick gelatinous conjunctiva stained evidently with too long continued silver treatment, deep fatty granulations and some fine scarring: cartilage fairly thick and curved. Arlt's Operation: very good result.
39. Lachmani: H.F.: Blepharospasm of both eyes with

fine inner hairs on to cornea: conjunctiva very red and congested with soft deep granulations. Arlt's Operation with canthoplasty in both eyes: very good result.

40. Ganna: M.M.: 50: marked entropion of both eyes with gelatinous conjunctiva and deep set glassy granulations easily expressed: both corneae show diffuse opacity. Arlt's Operation both eyes with slitting of canthus in left: good result.
41. Drupadi: H.F.: 40: entropion in both eyes: conjunctiva spongy and red with numerous fine fatty granulations embedded: cartilages soft and small and not much curved. Arlt's Operation both eyes: a number of hair bulbs cut across in left eye and picked out carefully: very good result.
42. Begam Jan: M.F.: 20: entropion in right eye with conjunctiva soft and spongy: blepharospasm: condition of left eye not noted. Arlt's Operation in right eye with slitting of canthus: good result.
43. Bholi: M.F.: 30: entropion in both eyes, cartilages thick and markedly curved: conjunctiva scarred but soft and thick in patches: cornea clear in both eyes. Snellen's Operation left eye: Arlt's Operation right eye. On leaving right lid still considerably swollen but hairs in good position: in left eye hairs a little down at inner end but quite clear of globe.
44. Jiwan: H.F.: 20: one or two hairs down in right eye: most of hairs down in left: cartilages hypertrophied. Arlt's Operation right eye: Snellen's in left: good result in both.

45. Bhagan Bibi: M.F.: 35: marked entropion both eyes: conjunctiva cicatrised, corneae clear, cartilages thick. Arlt's Operation right eye, Snellen's left: good result both eyes.
46. Bholi: M.F.: 25: marked entropion in both eyes: cartilages thick: right cornea slightly, left very hazy. Snellen's Operation both eyes with canthoplasty: good result.
47. Hassan Bibi: cartilage of right eye thick and curved: conjunctiva red and spongy: cornea hazy: no entropion in left eye. Snellen's Operation right eye: left Hospital with considerable swelling of lid and hairs rather down but free of globe.
48. Umr Bibi: M.F.: 40: marked entropion of both lids in both eyes: conjunctiva spongy: cartilages thick and hard: both corneae show diffuse opacity and are very vascular: very poor vision. Arlt's Operation right upper lid, Snellen's left: plastic operation both lower lids: good result in all except that some hairs rather down at inner end of left upper lid.
49. Hussan Bibi: M.F.: 18: marked entropion of both eyes with cartilages much thickened. Snellen's Operation right eye, Arlt's Operation left, with canthoplasty in both. On leaving, hairs in right eye considerably turned down but not touching globe: left lid a good deal swollen and edge irregular. Seen a month later: right eye as before: left eye much improved, but edge of lid still irregular and unsightly.

50. Sanja: M.M.: 65: both eyes operated on some years ago in another Hospital: a few hairs down at both ends in right eye, along whole outer half of lid in left eye: conjunctiva spongy and congested: cartilages very small and soft: diffuse opacity in both corneae. Arlt's Operation both eyes: good result.

Here ends our clinical study of Trachoma, a study very imperfect and incomplete as compared with the vast field presented for survey. Amidst the many avocations and distractions of a Medical Missionary's life, and the pressure of a large amount of general medical and surgical work of an urgent nature in a busy hospital, it is difficult to concentrate attention on a disease so widespread and apt to be regarded as so monotonous and commonplace as Trachoma. Enough, however, has been done to reveal the Protean character of the malady, its intense interest if carefully studied, and its importance as a scourge of humanity.

FINIS.

Note. The historical sections of this Thesis are based on study carried out during furlough in 1905 in the University & Advocates' Libraries, & the clinical sections on practice in the Church of Scotland Mission Hospital, Jala-Yun-Jattan, Punjab, India, from 1899 to 1909, & more particularly in the last named year.

APPENDIX - CHIEF BOOKS AND ARTICLES CONSULTED.

1. "An Account of the Ophthalmia which has appeared in England since the return of the British Army from Egypt", by John Vetch, M.D., Assistant Surgeon to the 54th Foot. London, 1807.
2. "A Practical Treatise on the Diseases of the Eye", by John Vetch: P.M.O. to the Ophthalmic Military Hospital, London, 1820.
3. "Mémoires de Chirurgie Militaire", by Larrey. Paris 1812 (Vol. 1.)
4. "Observations sur la Maladie appelée Pâste, le Flux dissenterique, l'Ophthalmie d'Egypte &c." Assalini. Paris. An IX.
5. "Medical Sketches of the Expedition to Egypt from India", by James McGregor, Superintending Surgeon to the Indian Army in Egypt. London, 1804.
6. "A Treatise on the Varieties and Consequences of Ophthalmia" by Arthur Edmonston. Edinburgh, 1806.
7. "Travels through Syria and Egypt in the years 1783, 1784 and 1785", by M.C.F. Volney: translated from the French. London, 1787. (Chap. XVII).
8. "Chirurgical Observations relative to the Eye", by James Ware. 2nd Edition. London, 1805.
9. "Compendium of the Diseases of the Eye", by Alex. Watson. Edinburgh, 1830. 3rd Edition.
10. "A Treatise on the Diseases of the Eye", by Wm. Lawrence. London, 1841. 2nd Edition.

11. "An Account of an Ophthalmia which prevailed in the Royal Military Asylum in 1804", Patrick MacGregor. 1812.
 12. "A Synopsis of Diseases of the Eye", Travers. London, 1824.
 13. "The Ophthalmia of Ireland", by John Williams. 1857.
 14. "Diseases of the Eye", Wm. Mackenzie. 4th Edition. 1854.
 15. New York Medical Journal: April 1904.
 16. Medical Record, Jan. 3 and 24 and Feb. 21, 1903: Sept. 17 and Dec. 31, 1904.
 17. British Medical Journal: Epitome, July 18, 1896: Feb. 20 and 27 (Epitome) 1897: July 23, Epitome, 1898: Feb. 4, May 6, July 1, Sept. 16 and 23, 1899: Oct. 2, 1909.
 18. Report of Eighth International Congress of Hygiene: Buda Pest, 1894: Vol. VII.
 19. Report of Eleventh International Congress of Medicine: Rome. Vol. VI.
 20. Report of Twelfth International Congress of Medicine: Moscow: Vol. VI.
 21. Report of Thirteenth International Congress of Medicine: Paris. 1900. Vol. XII.
 22. Report of Intercolonial Medical Congress of Australasia. 1889.
- Also Stephenson's "Epidemic Ophthalmia": Boldt's "Trachoma": Hourmonziadès "Conjonctivite Granuleuse":

Harman's "Conjunctiva in Health and Disease": Mayo's
"Changes Produced by Inflammation in the Conjunctiva":
Swanzy's, Fuchs', Norris and Oliver's Text books, and
Parson's "Pathology".