forms the outer epithelium, is very thin. There is a large space between the lens and the retina, containing the vitreous humour. The aqueous humour is not present, and the tissues in front of the lens have little resemblance to those of vertebrates. The cornea is represented by epidermis and subdermal connective tissue, which latter passes, without any sharp line of demarcation, into the dermis, and by a thick membrane continuous with the choroid, which represents the membrane of Descemet. The subdermal connective tissue is continued as an investment round the whole eye. There is no specially differentiated sclerotic, and a choroid is only superficially indicated. The peculiar features of the eye of this larval stage are probably due to degeneration.

In the brain, the two hemispheres lie one on each side of the thalamencephalon. There are well defined olfactory lobes and two distinct olfactory nerves present. The postnasal canal is partially developed, but is closed; but the development begun seems to be soon arrested. The excretory organs undergo considerable changes. A long series of segmental tubes, which first appear in a larva of about nine millimètres, becomes established behind the pronephros; and, in the *Ammocetes* of sixty-five millimètres, the pronephros has begun to atrophy. The generative organs are found in a larva of about thirty-five millimètres. Shortly before the metamorphosis, the portion of the cloaca into which the segmental tubes open becomes separated off as a distinct urogenital sinus, the walls of which become perforated by the two abdominal pores. The *Ammocetes* lives in the mud of streams. It grows larger without undergoing any marked alteration in structure, and, after three or four years, undergoes a further metamorphosis, and becomes developed into an adult lamprey, which dies shortly after producing its generative products. The changes which take place during this final metamorphosis are very marked. The dome-shaped mouth of the larva is replaced by a more definitely suctorial mouth, surrounded with horny cuticular teeth. The eyes appear on the surface, and the dorsal fin becomes more prominent, and is divided into two parts. Besides these changes, great modifications take place in all the organs. In the skeleton, an elaborate system of cartilages is developed in connection with the mouth. The cranium itself undergoes important modifications, and neural arches are formed. The branchial sac becomes detached posteriorly from the oesophagus; this latter then sends forward a prolongation above the branchial sac, which is at first solid. This prolongation forms the anterior part of the oesophagus of the adult, and joins the formative oral cavity at the velum. The so-called bronchus of the adult is thus the whole branchial region of the previous larval stage of the creature, and the anterior part of the oesophagus of the adult is an entirely new formation. The posterior part of the alimentary tract of the larva undergoes partial atrophy. The gall-bladder of the liver is absorbed, and the liver itself ceases to communicate with the intestine. The eye undergoes important changes in its passage to the surface, and acquires all the characters of the normal vertebrate eye. The brain becomes larger and more compact, and the optic lobes become more distinct. The pericardial cavity becomes completely separated from the body-cavity, and a distinct pericardium is found. The mesonephros of the larva disappears, and a fresh posterior part is formed.

SHORT SIGHT AMONGST THE BOYS OF GREENWICH HOSPITAL SCHOOL.

By Fleet-Surgeon HENRY HADLOW, R.N.

(Communicated by the Director-General of the Medical Department of the Navy.)

IN April 1881, a committee was appointed by the Lords Commissioners of the Admiralty to hold an inquiry upon certain points connected with Greenwich Hospital School; amongst others, upon the physical development of the boys under the system of industrial training that was then being carried out, and with especial reference to the very large proportion of boys—roughly, about 70 per cent.—who were found to be physically disqualified for the naval service. To assist in this inquiry, a return was prepared, showing the causes of unfitness for which each boy was rejected for the navy between April 1st, 1876, and March 31st, 1881, and the particular trade or industrial occupation at which the boy was employed, and the results were afterwards arranged by me in the tabular form that accompanies these remarks. It is open to the objection that a particular boy may not have been at any one trade during the whole period of his school-life; that he may, for example, have been engaged in the washhouse for a time before going to the tailor's

shop, or otherwise; but this will not affect the group of results to which I would call attention here.

On glancing over the table, the first thing that immediately arrests attention is the very large number of boys who are found unfit for the navy on account of defective vision, nearly all of them from simple myopia; which is the more remarkable from the fact, that the sight of every boy is tested either at his entry into the school or subsequently. All the boys who entered the school prior to the reorganisation in November 1878 were subject to a special physical examination at the age of thirteen years; and, if they were then found to show any defects that might subsequently render them unacceptable for the navy, they were discharged from the school. This examination included the special test for eyesight by Snellen's types, which they were required to read at the full distance; and consequently every boy in the school above the age of thirteen years must have had perfect vision at this period. Since the reorganisation, the same tests and the same perfection of eyesight have been required on the entry of the boy into the school. On pursuing the subject further, it was found that, out of 1,074 of these boys, no fewer than 60 were rejected for the Royal Navy at fifteen and a half years of age, on account of defective sight, the cause in almost every case being simple myopia (Report of the Committee on Greenwich Hospital School, Minutes of Evidence, Question 566 *et seq.*); or, in other words, it was found that in the short space of two and a half years, between the ages of thirteen and fifteen and a half, five and a half per cent. of the boys who had perfect vision when tested at thirteen had developed a degree of myopia, that rendered them unfit for admission into the service for which they had undergone a long and expensive training. If our investigations had ceased at this point, it would not have been an unreasonable proposition to suggest that myopia was a disease of youth likely to make its appearance during that particular period of life, and that it must be regarded as inevitable in a certain proportion of cases; but an examination of the causes of disqualification for which boys were rejected shows us, further, that the cases of myopia were not distributed equally throughout the school, but existed in a number out of all proportion to the rest in what is termed the select school and special class; and that, although this comprised only about one hundred boys, there were seventeen rejections between April 1st, 1876, and March 31st, 1881—a number which stands out with startling distinctness on the table attached to these remarks; and also that the myopia exhibited by these boys was of a higher grade than that found in the rest of the school.

We have thus established, beyond any possibility of doubt, two facts with regard to the origin and causation of short sight; firstly, that it is developed during the school life of the boys; and, secondly, that it is found most frequently, and of the highest grades, amongst the lads of the more advanced classes, and who spend most of their time in study and reading. There is nothing new in these results; they only confirm, in a very emphatic manner, the observations of Dr. Cohn of Breslau, who was the first to undertake an independent examination as to the prevalence and causation of short sight amongst the scholars of the local schools. In the course of his inquiries, he examined the eyes of 10,060 children, and of these he found no fewer than 1,004 myopic. His researches went on to prove that this defect of vision originated during school-life; that it showed a progressive rate of increase as the children advanced from the lower and more elementary to the higher classes, where the eyes were kept more continuously employed; and, further, that it existed in the largest proportion in those schools in which the light was deficient, or badly arranged, or where unfavourable optical conditions were found to prevail. The attention of the medical profession having been directed to the question, confirmatory evidence was now forthcoming from Russia, America, Alsace-Lorraine, and in England, where the subject has been treated of by Mr. R. Liebreich (*School Life in Its Influence on Sight and Figure*), and Mr. Brudenell Carter (*Eyesight, Good and Bad*, by R. B. Carter, F.R.C.S. 1880).

It is impossible to overrate the importance of these considerations to all those who are interested in the education or bringing-up of the young. Not only is asthenopia or myopia a most serious disqualification for many conditions of life, but we have every reason to believe that the predisposition to become short-sighted is hereditary, and that the children of short-sighted parents have a much greater tendency to develop the same defect, if placed under unfavourable conditions than others. To the principals of all schools having for their object the training of boys for a naval or maritime life, the subject is one of vital importance. At sea, perfect vision is an absolute necessity; the safety of a ship may, and often does,

Analysis of the Return of Greenwich Boys rejected for the Royal Navy from April 1st, 1876, to March 31st, 1881; showing the Trades at which they were engaged, and the Causes of their Rejection. Where more than one disability that would cause rejection is shown by the same boy, he is entered in each column.

DISABILITIES CAUSING REJECTION.	TRADES.																						
	Bakers.	Band.	Barbers.	Blacksmiths.	Bricklayers.	Carpenters.	Engine-room.	Hair-pickers.	Kitchen and scullery boys.	Knitters.	Mat-makers.	Painters.	Pupil teachers and writers.	Sail-makers.	Select school and special class.	Shirt-makers.	Shoemakers.	Store boys.	Tailors.	Washers, ironers, laundry repairs, etc.	Weavers.	White frock makers.	
Number generally employed	24	90	2	12	8	36	—	8	24	20	18	12	20	24	100	20	40	—	170	218	18	—	
Under standards	7	3	—	2	3	3	—	1	9	4	11	2	2	16	27	—	12	1	30	37	4	1	
Varix and varicocele	—	—	—	—	1	—	—	1	3	2	2	1	2	2	10	—	3	—	6	5	1	—	
Defective sight	1	1	1	1	1	—	—	—	2	—	1	—	3	2	17	1	1	1	2	7	1	—	
Defective hearing	3	1	—	1	—	—	—	—	2	1	—	1	—	4	4	—	1	—	2	5	—	—	
Defective teeth	—	—	—	—	2	—	—	1	1	1	—	1	—	3	1	—	—	—	1	4	1	—	
Glandular swellings...	1	—	—	—	—	—	—	—	—	—	—	—	—	—	4	—	1	—	3	1	—	—	
Deformities	3	1	—	1	—	1	—	—	2	2	—	—	—	2	4	—	1	1	—	3	3	—	
Scrofula and phthisis	—	1	—	—	—	—	—	—	—	—	—	—	—	—	4	—	—	—	4	1	1	—	
Delicacy and want of development	—	1	—	—	—	—	—	—	—	1	—	—	1	1	4	—	—	—	5	1	—	—	
Diseases of heart	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	—	—	—	
Diseases of lungs	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	
Diseases of skin	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	
Incontinence of urine	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1	—	—	—	
Stammering	—	—	—	—	1	—	—	—	—	—	1	—	—	—	—	—	—	1	—	1	—	—	

depend on the quick recognition of a signal light; the issue of an engagement may turn on the promptness with which a few distant flags can be made out, and their message correctly interpreted, and the long range guns of the present day would be useless in the hands of men with a restricted range of sight, and to these, more than any others, it is imperative that the conditions under which myopia is induced should be sought out and rectified. Dr. Cohn had very little hesitation in attributing the defective vision which he found so prevalent, to the imperfect lighting of the schoolrooms, and to the bad construction of the desks and forms at which the children worked and sat, causing them to bend over their task, to bring the eyes unduly close to the book, and thus keep up a strong consequent effort of the ocular muscles. Mr. Liebreich says that asthenopia, amblyopia, and short sight "all arise from the same circumstances—viz., insufficient or ill-arranged light, or from a wrong position during work. Insufficient or ill-arranged light obliges us to lessen the distance between the eye and the book while reading or writing. We must do the same if the desks or seats are not in the right position, or of the right size and shape. When the eye looks at a very near object, the accommodating apparatus and the muscles which turn the eye so that the axes converge towards the same object are brought into a condition of greater tension, and this is to be considered as the principal cause of short-sightedness and its increase" (*School Life in Its Influence on Sight and Figure*, page 8).

At Greenwich, as at other schools constructed before these views were understood, or it was suspected that the condition of the schoolroom was so closely connected with defective vision, we found all the defects to which Mr. Liebreich refers. The desks and stools were of the usual old fashioned construction, of the same height for boys of all sizes and ages, with no backs, narrow seats placed much too far from the edge of the desk, and want of proportion between the height of the two. Notwithstanding the very praiseworthy efforts of the teachers, it was easy to see that the habit of stooping over the book and sitting in a constrained awkward position was inevitable. Again, some of the rooms were so dark in corners, and "very large corners" too, that it would be impossible on a winter's day for the boys to see to do their work properly without gas. The Rev. J. G. Daugar, whose evidence we are here quoting, goes on to say—"It was almost too dark in one or two cases at five o'clock yesterday afternoon (June 23rd). I commented upon the matter on the spot where some of the boys were working. The result of that is that you find figures badly made, and indifferent writing, and it cannot be helped; you cannot scold a boy for it, because he has the answer at once, 'I cannot see to do it better.' But there is another point in connection with the lighting, in almost every case—I believe in every case—the desks are placed so that the boys must sit with their backs to the light. This is a most absurd arrangement, because the boys sit in their own light for everything they do." (Report of Committee. Minutes of evidence. Question 2,165.)

Here then we have in an extreme degree all the conditions

that are considered to favour the development of short sight; and these conditions were not peculiar to Greenwich Hospital School, but were unfortunately only too common in establishments of a similar nature. In a very large and richly endowed school, visited during the course of the inquiries, the lighting of great part of the class-rooms was so deplorably bad that it is a matter of wonder how the boys could perform their tasks at all on a dull day. There were no statistics as to the prevalence of short sight in the school, but it is a curious coincidence that the only person I have met with in later years who was educated there, is myopic in an extreme degree. Desks and forms of improved shape and better construction have been devised to meet these evils, and are now in pretty general use; they are of graduated sizes, to suit boys of different ages; there is a board behind to support the loins just above the hips; the edge of the desk is perpendicularly above the front of the seat, and the inclination of the desk can be altered from 20° for writing, to 40° for reading, whilst a foot-board is attached, on which the feet rest naturally and easily. A suitable desk having been thus obtained, it remains to place it in such a position as to secure for it not only a sufficiency of light, but that the light shall fall in a right direction, from the side and above, preferably from the left, as the shadow of the hand will not then be projected on the paper in writing. It is greatly to be regretted that this important consideration should be so much neglected in schools. The ill effects of having the windows at the back of the children have been already referred to, but the still more objectionable practice of placing the desks facing the light is only too common; the books from which the scholars are working will then be completely in shadow, whilst the glare of light in front will compel the children to assume any position that will shade the eyes, and their sunk heads and contracted brows will at once strike anyone who visits such a school on a day of any moderate brightness.

The wise and beneficent liberality of their lordships has enabled the evils formerly existing at Greenwich to be corrected in a most complete manner. Obstructive partitions have been removed, windows have been inserted, a complete system of new desks of the most approved make has been supplied, and they have been rearranged throughout, with the object of placing them in the right position with regard to the windows, and securing not only abundance of light in every part of the room in which the scholars sit, but its correct incidence. Cubic space is abundant; ventilation and warming arrangements have been revised upon the most approved principles; and the class-rooms, in all sanitary particulars, may be regarded as models that might well be copied by any educational establishment of the highest class; indeed, I think there are very few that would not suffer by any comparison.

By well considered measures of sanitation, such as this; by properly constructed desks to take the strain off the ocular muscles; by abundantly lighted class-rooms; and by watchful care on the part of the teachers to prevent that bad habit of drooping their heads over their work and stooping into which children will commonly fall if not corrected; there is no doubt that the evils to sight

of long hours in school may be minimised; but the importance of fresh air, exercise, and out-of-door occupations and relaxations must not be overlooked, not only from their influence in maintaining the general health and tone of the system, but from the condition of rest given to the ocular muscles by looking at out-of-door and moderately distant objects.

In a report on the education of the young in Alsace-Lorraine, extracts from which have been published in some of the medical journals (*Lancet*, October 7th, 1882), it is stated that boys of thirteen years of age have, on an average, about eight hours' study a day. It would be too much to suppose that any mechanical arrangements of desks or windows could neutralise the effect upon eyesight, as well as upon the general health, of such an amount of close application at the very time of life when growth ought to be most active, and the physical development most carefully fostered; and it causes little surprise when we read, further, that amongst the young men who have of late years passed the educational standard that qualifies them for voluntary military service, no fewer than 80 per cent. were physically unsuited for the army, whilst the extreme prevalence of myopia has long been well known. Higher culture is too dearly purchased at such a price as this, and there does not appear to be at present any fear that our youth will be subject to such a discipline, the tendency is rather the other way; but since it can be clearly demonstrated that, even under our own mild educational system, myopia does arise during school-life, and under conditions that are well known and apparently removable, it becomes a matter of special interest to all those engaged in educating or training boys for the navy or mercantile marine to make themselves acquainted with the circumstances under which short sight may be induced, and how it may be best prevented.

ON SOME RECENT METHODS OF TREATING GRANULAR LIDS.

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THE difficulties attending the effectual treatment of granular conjunctivitis (trachoma) have been demonstrated by long experience. They are found almost equally formidable, whether the disease be recent or of long standing, acute or less severe; and thus we naturally turn with avidity towards any new remedy that may be recommended.

I venture to lay before the members of the Association a summary of my recent experiences of the treatment—first introduced into Europe, from the natives of Brazil, by De Wecker of Paris (*Annales d'Oculistique*, pages 86 and 211)—inoculation by jequirity (the *Abrus precatorius* of the natural order Leguminosæ).

The seeds, which are extremely hard and tough, are first broken and freed from their shell. They are infused for two hours in cold water, in the proportion of 1 to 50; by this time they are so softened as to be easily pounded up, after which they are soaked in the same water for twenty-two hours more. The solution now requires only careful filtration to be ready for use. It is applied to the everted lids, or, when this is impossible, between the lids, thrice daily, till a severe conjunctivitis, of a purulent or diphtheritic type, is produced. I append a brief summary of certain cases, which may indicate, to some extent, the relative value of this and other methods of treatment.

CASE I.—A. B., aged 10, was admitted into Guy's Hospital on account of sago-like granulations on the conjunctiva of both lids of each eye. There was considerable pain and photophobia. The corneæ were clear. The disease was of ten months' standing only. Following a recent suggestion of Galezowski, the left eye was treated by excision of the much diseased oculo-palpebral fold; but, for the right, the mitigated nitrate of silver stick was used freely. On the fourth day, both were treated with the stick, and this was continued for two months. At the end of this time, the improvement was greatest in the unoperated eye. But, as the sago-like granulations were still there, together with some pain and photophobia, it was decided to treat with jequirity. After the ninth application, there was chemosis, with some increase of pain. The inner surface of the lid was lined by a thin lympho-purulent layer, which could be readily detached without causing bleeding. At no time was there a free purulent discharge from between the lids. On ceasing the inoculation, the inflammation gradually subsided, till, one month later, the pain and photophobia were gone. Sago-like granulations are, however, still present, though in diminished number.

CASE II.—W. B., aged 17, sailor, was admitted into Guy's Hospital on December 6th, 1882. The left eye was normal, but the right was severely affected with trachoma of both lids, and great corneal vascularity. For the first two months of his stay in the hospital, he was treated with bi-weekly applications of mitigated nitrate of silver stick, after the performance of syndectomy. The improvement of the lids being but slight, and the cornea still retaining its vascularity, it was decided to use jequirity. After the seventh application, there was severe pain, with abundant transparent, slightly yellowish, scalding discharge. A thin membranous, or so-called diphtheritic-looking layer, lined both lids, to within two millimetres of their free edge. For the last two nights he had no sleep, on account of the pain and discomfort. The inoculations were now ceased, as the membrane was still becoming thicker, though the conjunctiva was never edematous. On the seventh day, the layer was soft and purulent-looking; and from this time it gradually disappeared. There was, however, never any great amount of purulent discharge. Henceforward the eyes gradually improved till, one week later, he went to a convalescent home. Six weeks later, his eyes and general condition were much improved. The iris and pupil were now for the first time visible through the cornea. There were, however, still some sago granulations on the conjunctiva.

CASE III.—C. H., aged 15, a pallid undersized girl, had had trachoma of both eyes for nine years. On admission, both corneæ were vascular, and only semi-transparent. The palpebral conjunctiva in each eye presented, besides occasional areas of cicatricial tissue, some sago-like granulations. She had pain and photophobia one year ago. She was treated as an in-patient, for five weeks, by Mr. Bader, with injections of ointment of yellow oxide of mercury beneath the lids, from which she received benefit. She was re-admitted on October 17th, 1882, when mitigated nitrate of silver stick was applied every fourth day. At the end of two months, she went out somewhat benefited. On March 17th, she was re-admitted, as the right eye had somewhat receded, being now considerably injected. The left eye, on the other hand, had improved since her discharge. Inoculation with jequirity was now tried, but did not take well, producing only slight so-called diphtheritic infiltration, and afterwards scanty purulent discharge. She was sent out very considerably improved, notwithstanding that a considerable number of vascular granulations still remained.

The result of these and other cases shows that, in jequirity, we have a drug of decided value. Though it does not, in ordinary cases, immediately destroy all the granulations, it diminishes very considerably the pain and photophobia, and has a decided influence in clearing the cornea. Nor does it appear to affect this tissue injuriously, in which respect we must admit it to be decidedly superior to inoculation from cases of ophthalmia neonatorum. At first, I had considerable hesitation about introducing cases of inoculation with jequirity into the general eye ward; but I have not found that it makes any difference to the progress of other cases, whether operative or not. Though precautions against contagion have naturally been taken, we have not succeeded in inoculating into the sound eye the ophthalmia produced by this agent.

CASES OF PENETRATING GUNSHOT WOUND OF THE ABDOMEN.

By ARTHUR H. ROBINSON, M.D. Durh., M.R.C.S.,

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THE following examples of the above injury may prove of interest when read with Professor George Buchanan's case published in the BRITISH MEDICAL JOURNAL of March 31st. They both came under my notice in the Hull Infirmary, during the years 1879-80; and I am indebted to my friend Mr. Craven, under whose care they were, for permission to record them.

J. T., aged 36, chief engineer on board a steamship, was admitted into hospital on September 11th, 1879. Whilst examining a loaded revolver on board his ship, one of the barrels exploded, and the contents were lodged in his abdomen. He was brought some distance in a cab, and arrived at the hospital half an hour after the occurrence of the accident. He walked to his ward, and was at once placed in bed. On examining the abdomen, a clearly-cut linear wound, with slightly inverted edges, was found two inches below the umbilicus, and two inches to the left of the middle line. The patient complained of considerable pain all over the abdomen; his skin was cold and moist, breathing short, pulse small and very rapid. In order to ascertain the precise direction taken by the bullet, a probe was cautiously passed into the opening, and it was at once deflected to