With regard to correlation of varieties, the lecturer observed that several are often present in the same subject, and they are often associated with varieties in other structures; and the same kind of variety is often repeated in the same person. They are also often symmetrical; but the corresponding varieties are not commonly found in the upper and lower limbs—that is, the serially homologous muscles are not usually affected in the same person. Males and females, and the two sides of the body, are equally liable to be affected; and the other races of mankind, and some of the lower animals, are, as far as the evidence goes, as liable to muscular varieties as ourselves.

The varieties are themselves very varied—that is, an additional muscle, or head of a muscle, is scarcely alike in any two instances of its occurrence. There are, however, certain lines or directions, as they have been called; and these are often in the direction of the normal form of some lower animal, chiefly of those nearest to man, also not unfrequently of those remote from him in the animal scale. This the lecturer regarded as an illustration of the similarity of the forces which are in operation in the evolution of the several animals, and not necessarily as an evidence that the one has been evolved from the others, and that the varieties are therefore to be regarded in the light of reversions to the form of some other animal or animals.

The muscles of the abdomen were first considered. The varieties in most of these were described as few and unfrequent, which accords with the simple disposition of these muscles and the little variation they present in the different classes of animals. In the obliqui and transversalis they are almost limited to the occasional persistence of inscriptions over the ribs or the costal cartilages. The most frequent varieties are in the two muscles which are most easily spared—viz., the pyramidalis and the psoas parvus. These are often absent. Yet one of them, the psoas parvus, is very generally present in mammals, while the other is more frequently absent. In the rectus also the varieties are few. In the lower mammals this muscle is often prolonged upon the thorax as far as the first rib. This is not the case even as a variety in man. Still, a muscle not continuous with the rectus, but in other respects resembling this continuation of the rectus, and forming what the lecturer called the “rectus thoracicus profundus,” is sometimes found beneath the pectoral muscles. It is to be distinguished from the rectus “thoracicus superficialis,” also called “sternalis,” which lies upon the surface of the pectoralis, which is often continuous with the sterno-mastoid, and which the lecturer believed to be a partial representative of the extension of those superficial strata of the mesial portion of the abdominal wall into the sterno-mastoid which are found in lower vertebrates. It was pointed out that this last-named anomalous muscle has no representative in other mammals, birds, or higher reptiles; and it was suggested that its frequent occurrence in man may have some relation to the flatness of the front of his thorax, affording space for its development.

The muscles of the neck were next discussed. The platysma and the sterno-cleido-mastoid do not often present varieties, whereas the sterno-hyoid and sterno-thyroid and the digastricus and the stylo-hyoid are the seat of many and frequent varieties. A detailed account of these was given, and their relation to the primitive strata and to the muscles of lower animals was pointed out at length.

THE HÆMATOZOON :

NOTES ON ITS DISCOVERY AND ITS RELATION TO THE CANINE FILARIA.

By D. D. CUNNINGHAM, M.B.

In a recent number of THE LANCET* a paper was published by Mr. Welch, “On a Species of Filaria found in the Interior of the Vascular System of a Dog: relative to the filaria in the blood, and the ova and larvæ of a nematoid worm in the urine of man.” The paper contains a careful description of the mature female, the ova and embryos of the canine filaria, and is illustrated by figures

exhibiting structural details. The question of the relation of the canine and human filariæ is also discussed, and in this portion of the paper some statements are made on which I desire to make a few comments.

These statements refer (1) to the history of the discovery of filariæ in the urine; and (2) to an assumed close resemblance between the canine and human worms.

Regarding the first point, we find it recorded that, “Turning to the existence of larvæ and ova of nematoid worms in the human fluids, there is the original discovery of ova in the chylous urine made by Dr. Salisbury, and narrated in *Hay’s American Journal*, 1868, p. 376. These ova were, according to Dr. Cobbold, ‘about $\frac{1}{800}$ ” in length by $\frac{1}{1600}$ ” in breadth; in a state of segmentation of the yolk or embryo-containing’; not far removed in size from the ova of the canine filaria, and, comparing the sketches, markedly resembling them. Dr. Cobbold also, while pursuing the natural history of the bilharzia, obtained from a patient urinary parasites in the egg condition and dead embryos, which, ‘in spite of discrepancy of size,’ he considers ‘were identical with those of Dr. Salisbury, and referable to one and the same species of nematoid worms.’ Subsequently Dr. Lewis detected microscopic filariæ in fifteen to twenty patients suffering from chyluria.” Now (1) Dr. Salisbury never discovered ova in chylous urine; (2) there is every evidence that the ova and embryos in both Dr. Salisbury’s and Dr. Cobbold’s cases were mere accidents, and not true urinary parasites at all; and (3) even had they been so it is incorrect to state that Dr. Lewis’s discovery was subsequent to Dr. Cobbold’s.

In reference to the first statement it is to be presumed that the author had not an opportunity of consulting the original case, but it is somewhat astounding to find Dr. Cobbold, who “unearthed”* Salisbury’s paper, confounding *cystinuria* with *chyluria*. Dr. Salisbury’s description of the case is as follows:† “This patient was an old lady, aged about sixty-five. She had cystinic rheumatism, and was partially paralysed, and had been insane for several years. She was labouring under severe cystinemia, which were regarded as the main cause of the rheumatism and paralysis. When the patient originally came into my hands there were from five to fifteen ova in every drop of urine voided. Her urine was passed milky, with granular cystini, and was dense and scanty. There was partial paralysis of the bladder, so that her water was constantly dribbling from her.” It is evident that the only phenomenon in the case in any way resembling the phenomena of chyluria was a milkiness of the urine, but a *milkiness due to granular cystine*, a material hitherto not observed in connexion with chyluria. If every case in which the urine contains whitish suspended matters is to be styled one of chyluria, the disease will be found to be much more widely diffused than it has hitherto been considered to be.

The disease in Dr. Salisbury’s case being thus disposed of, we may proceed to consider the characters and probable nature of the entozoa occurring in it, as well as in Dr. Cobbold’s case of bilharzia.‡ That they were totally dissimilar from those discovered by Dr. Lewis will be seen at a glance on comparing a reproduction of Dr. Salisbury’s original figure (Fig. 2) with a drawing of the filaria of chylous urine equally magnified (Fig. 3). No words are needed to indicate the entire difference between the two organisms. The different nature of the two entozoa is also indicated by the fact that whilst in Drs. Salisbury’s and Cobbold’s cases ova and ova-contained embryos were the structures discovered, in chyluria no such bodies have been as yet detected.§ Dr. Cobbold has himself identified the entozoa in his own and Dr. Salisbury’s cases, so that they may be considered together. Two very significant facts are at once encountered in regard to these cases—viz., that the same ova and embryos occurred in two very different diseases, in very different kinds of urine, and that the only common point in the two cases is that *both patients were females*.

Now it has long been on record that it is in females that intestinal entozoa, their ova and embryos, are liable to ob-

* Medical Record, No. 1, vol. i., p. 5.

† American Journal of Medical Sciences, No. cx., p. 376.

‡ British Medical Journal, July 27th, 1872, p. 89.

§ Dr. Lewis has collected and carefully examined the sediment of at least twelve gallons of chylous urine, and has frequently afforded me opportunities of examination, but in no instance have unequivocal ova been detected.

tain accidental entrance into the urine, the anatomical relations of the digestive and urinary apparatus being such as to facilitate the wandering of entozoa from the former into the latter. Such wandering has been specially observed in the case of *Oxyuris vermicularis*, and there is reason to suspect that the ova and embryos in the cases under discussion were merely those of this common parasite. This may appear to be a bold statement, but evidence in its support is not wanting. The measurements of the ova and embryos, when arranged in a tabular form, give the following results :—

	OVA.		EMBRYOS.	
	Length.	Breadth.	Length.	Breadth.
Salisbury's case ...	$\frac{1}{800}$ "	$\frac{1}{1540}$ "	$\frac{1}{500}$ "	—
Cobbold's case ...	$\frac{1}{500}$	$\frac{1}{1000}$	$\frac{1}{150}$	$\frac{1}{2000}$
<i>Oxyuris vermicularis</i> :				
Leuckart ...	$\frac{4}{78}$...	$\frac{1}{1041}$...	$\frac{1}{178}$...	$\frac{1}{2500}$
	$\frac{1}{500}$...	$\frac{1}{1562}$...	—	—
Cobbold ...	$\frac{1}{900}$...	$\frac{1}{1400}$...	—	—

The above figures show a very close correspondence with one another, the variations being so slight as to be easily accounted for by variations in the media in which the ova were immersed and by differences in the age of the embryos. But both cases contain other evidence in favour of the same view: for in Dr. Salisbury's case "her water was constantly dribbling from her," implying more or less constant patency of the urethral canal; whilst Dr. Cobbold states, in regard to his case,* that "it is not a little remarkable that the parents should have averred that she passed three

discovery was not subsequent to Dr. Cobbold's. Dr. Lewis's Report, in its original form, is dated April 1870; and the paragraphs in it relating to the filaria were reprinted in full in the *British Medical Journal* of the 19th November, 1870, and referred to in other journals at an earlier date. Before leaving the subject of the priority of discovery, it may be well to allude to a letter by Dr. Priestley in the *British Medical Journal* (Feb. 15th, 1873). The letter contains the following passage :—"In reference to the subject I may point out that, as long ago as 1857, I described a case of chylous urine, in which the milk-like fluid passed from the bladder was found, on microscopic examination, to contain innumerable linear vibrios, or filariæ, which moved in every direction across the microscopic field"; and "in drawing attention to this early notice of active organisms in chylous urine, I do not in the least wish to detract from the interest and value of Mr. Lewis's discovery of hæmatozoa in the blood, and their relation to the filaria of chyluria." The occurrence of vibrios in urine is a well-known fact, but has nothing to do with filariæ. On turning to the discussion of the relations existing between the canine and human filariæ, we find the following passage in Mr. Welch's paper :—"A comparison of the embryo of the canine filaria with the woodcuts of Dr. Lewis's hæmatozoon (especially Fig. 3) will show a great concordance in anatomical details when the modifications resulting from death are taken into consideration. The contour and body structure are the same in both, even to the vacuole near the head. The 'delicate enveloping tube' of the human worm is absent in the canine, but by Fig. 1, No. 1, Dr. Lewis's woodcut, it is equally so in the dead hæmatozoon. These remarks will be more lucid by comparing Fig. 10, a dead hæma-

Fig. 1.—Ovum of common thread-worm (*Oxyuris vermicularis*) containing a nearly mature embryo. Highly magnified. (After Leuckart.)
Fig. 2.—Facsimile of Dr. Salisbury's drawing of "*Trichina cystica*." Magnified 1000 diameters.
Fig. 3.—*Filaria sanguinis hominis* carefully drawn to scale. Magnified 1000 diameters.

small vermiform entozoa by the urethra, corresponding, to judge from their verbal statements, very closely with the ordinary appearances of *Filaria piscium*." Judging by verbal statements between parasites so minute as *Filaria piscium* and *Oxyuris vermicularis* is ticklish work; and it is amusing to find Dr. Cobbold, in his haste to discover some new and startling relationship for his ova and embryos, neglecting to take the common parasite into consideration. Dr. Salisbury's figure completes the chain of evidence, for his "*Trichina cystica*" (Fig. 2) possesses the general contour and characteristic oral aperture of the immature embryos of *Oxyuris vermicularis* (Fig. 1, after Leuckart). Were the embryo of Fig. 1 unfolded, it would be almost identical in appearance with Fig. 2. The accidental occurrence of the ova or embryos of entozoa in urine is a fact regarding which observations have long been on record, and it is incredible that any dispute should arise at the present day regarding the right of priority in the discovery of it. Almost as well might a discussion be raised regarding the right of priority in the discovery of cotton fibres in urine. Even, however, had the ova and embryos described by Dr. Cobbold proved to be true urinary parasites, Dr. Lewis's

tozoon, sketched from specimens sent to Netley by Dr. Lewis, with Fig. 8, the dead embryos of the canine filaria—all equally magnified." In this passage the writer advances the proposition that there is a great concordance in anatomical details between the two filariæ, and forthwith proceeds to demonstrate that it is totally untenable. It is only when the words are used loosely that it can be affirmed that "the contour and body structure are the same in both," whilst, by Mr. Welch's own showing, every characteristic and important feature in each differs. The body structure cannot be the same when there is no evidence of striation in the canine worm. The distinctness of the striæ in the human filaria was cautiously understated in the original drawings, but subsequent observations have clearly demonstrated that Dr. Lewis's statements regarding the existence of such markings were absolutely correct (Fig. 3). That the enveloping sac should not be distinctly shown in the figure of the human worm referred to merely shows that the representations of the filariæ in Dr. Lewis's figures are copies from individual specimens, and not idealised diagrams. The non-appearance of the sac in that specimen may have been due to the contained embryo being fully extended, and occupying it in its entire length, or may have arisen from

* *British Medical Journal*, July 27th, 1872, p. 92.

the position of the sac or the lighting of the preparation having rendered it invisible; but there is no evidence of its actual absence. That the contour of the two filariæ is the same will hardly appear very evident to anyone who compares Mr. Welch's figures with Dr. Lewis's original figures, or with that now published. Mr. Welch himself allows that the relative length and breadth in the two filariæ are very different, and the marked difference in contour arising from this, as well as from the abruptly truncate head and elongated tail of the canine worm as compared with the conical head and comparatively short tail of the human one, cannot fail to strike all observers. Badly preserved specimens of almost any small filariæ will retain certain features of generic resemblance to one another when every specific feature in their structure has been lost or obscured by imperfect preservation, and Mr. Welch's figure would appear to have been drawn from a bad, or rather distorted, specimen of the human filaria, as the length and breadth are totally out of proportion to one another in it.

It is no doubt a difficult matter to obtain a correct idea or drawing of filariæ when preserved along with blood, as they are very liable to be obscured by the mass of blood-corpuscles, or distorted by the coagulation of the fluid. Prolonged preservation in spirit does not obscure either the enveloping sac or the transverse striæ (Fig. 3), so that had such features been present in the canine filaria, there was ample opportunity for their detection. It would have been better to have compared the drawings of the canine filaria with the original correct drawings of the human filaria.

In conclusion, it may be stated, first, that until it can be distinctly proved that true filariæ had been observed in chylous urine before March, 1870, Dr. Lewis must be regarded as the original discoverer of their presence there, as well as in the blood; and, secondly, that no evidence has as yet been adduced in favour of the existence of any close relationship between the canine and human hæmatozoa.

TRANSFUSION OF BLOOD

IN THE CASE OF A PATIENT SUFFERING FROM PURPURA.

By THOMAS SMITH,

SURGEON TO ST. BARTHOLOMEW'S HOSPITAL.

A. S—, aged eight, was admitted into the Children's Hospital February 14th, 1873, under Dr. West's care, with a purpurous eruption on various parts of the body. While in the hospital the eruption nearly disappeared, and no bleeding took place. On March 6th she was sent to the Convalescent Hospital at Highgate, and came under Dr. John Murray's care.

At Highgate she suffered severely from epistaxis, for which she took perchloride of iron, was injected subcutaneously with ergotine, and latterly was obliged to have her nostrils plugged with lint steeped in perchloride of iron.

On May 1st she was sent back to the Children's Hospital to be under Dr. West's care, on account of the frequently recurring epistaxis. Appropriate constitutional remedies were ordered, and no bleeding occurred until the second day from her admission. On that day she was well enough to sit up in bed, and read for her own amusement. She had had a good night, and her temperature was 98.6°, when bleeding came on from the left nostril, and continued off and on the whole day; in the evening the anterior nostrils were plugged, and various means were used to restrain the hæmorrhage, but without effect. During the whole of this day she vomited at intervals, and neither food nor medicine could be retained.

I first saw the patient on Saturday, May 3rd, at 9 A.M. The epistaxis had ceased two hours. She was absolutely blanched; her skin was cold, and her pulse almost imperceptible. The temperature was 97°; the conjunctivæ were insensible. She was in a lethargic condition, but could be roused. No nourishment had been given for some hours, as her stomach would retain nothing. I suggested transfusion, and advised the cautious administration of small quantities of milk-and-brandy by the mouth, and a nutrient enema at once.

Dr. West, under whose care the patient was, having been

consulted, considered the performance of transfusion justifiable, and at 12.30 the operation was performed, the pulse being at that time imperceptible, the temperature 97°, the conjunctivæ insensible, and the voice almost lost. Indeed, the general condition had somewhat deteriorated since the morning, though the child had retained a few spoonfuls of brandy-and-milk and an enema of beef-tea.

The apparatus employed consisted of a wire egg-beater, a hair sieve, a three-ounce glass aspirator syringe, a fine blunt-ended aspirator canula, having a lateral and a terminal opening, a short piece of india-rubber tubing with a brass nozzle at either end connecting the syringe with the canula, a tall narrow vessel standing in warm water for defibrinating the blood, and a suitable vessel floated in warm water to contain the defibrinated blood.

The blood was drawn from a healthy adult, and was allowed to flow into a three-ounce measure; as the measure became filled it was poured into the tall, narrow glass vessel, and subjected to the action of the egg-beater by Mr. Haward, who rotated the beater between the palms of his hands. When twelve ounces of blood had been collected the vein was closed. The blood having been whipped for three or four minutes, it was strained through the hair sieve, and again subjected to the action of the egg-beater for about the same time. At the end of the first beating a considerable quantity of fibrine had collected on the egg-whip; this was not removed, as it might serve to entangle any fibrine remaining in the blood. After the second beating the blood gave up as much or more fibrine as it did after the first. The blood was again strained into a vessel kept at a suitable temperature in warm water.

A vein being opened at the bend of the patient's arm, the canula (which with the syringe and india-rubber tubing had been kept immersed in warm water) was introduced for the distance of an inch or more into the canal of the vein, and held in position by Mr. Haward. The syringe, being filled with blood, was connected with the india-rubber tubing, and a little blood was forced through this to expel the air; the tubing was then connected with the canula, from the orifice of which a few drops of the patient's blood were flowing, so that one was assured that no air was in the canula. Eleven ounces of defibrinated blood were thus slowly injected. During the process the child's pulse became perceptible, and the sensibility of the conjunctivæ returned; the breathing was not quickened, nor was there any dyspnoea. Directly after the transfusion the temperature was 98°; pulse 160, and regular; respiration 40; the voice also returned. In the course of an hour the respiration rose to 80; the pulse became weaker; and the child died at 3.15, two hours and a half after the completion of the transfusion.

The following is an abstract of the post-mortem examination, forty-three hours after death, which has been carefully and minutely recorded by Mr. Beach. A few purpurous spots were found scattered on the body; one or two were situated on the visceral pericardium; over the right cerebral hemisphere was an effusion of blood as large as a five-shilling piece, and apparently recent. The heart weighed 4½ oz.; both ventricles were contracted, the left containing fluid, black blood, and some adherent pale-red clot; the left auricle also contained fluid blood and some pale-red coagula. The right ventricle contained a moderate quantity of fluid blood, and a small reddish coagulum passing into the pulmonary artery. Both auricles contained some post-mortem clots. Following up the riband-like clot in the pulmonary artery, which was of pale-reddish colour, no signs of embolism were found either in the large or small pulmonary vessels. The lungs were crepitant throughout, and collapsed completely on the opening of the chest; there were no lobular congestions or solidifications of the lung-tissue.

Remarks.—I have described the operation somewhat minutely from the fact that, the whole question of transfusion being at present under discussion, the record of the manipulative details are of some importance.

In a patient known to be suffering from purpura, it may be asked, why employ defibrinated blood? My reply is, on account of the difficulty of using natural blood unless with proper appliances. I believe that if natural blood is to be used, the best way of introducing it is by direct transfusion with Dr. Aveling's apparatus, and this I should have employed had I been able to procure the instrument. I had at hand Ferguson's instrument for transfusion, with