Sternum oval, pointed behind, and similar in colour to the cephalothorax.

Legs pale dull yellowish, the femora being dark brown, and the tibiæ, metatarsi, and tarsi marked with brown, giving them a somewhat annulated appearance; beneath the terminal claws is a small claw-tuft.

The *palpi* are short, and of a more uniform pale-yellowish colour, clothed with, among others, some pale scale-like hairs above; while the digital joints have numerous longer, blackish ones beneath.

Abdomen short-oval, and of dark maroon-brown colour, thinly clothed with short, pale grey, or whitish, rather shining, somewhat squamose hairs; an indistinct pale stripe runs obliquely from just beneath each side of the fore extremity to, or towards, the spinners; the central longitudinal line is broadly blackish, but not very distinctly defined; and there are, on its hinder part, some very indistinct paler, sharply angular lines in a longitudinal series; on the underside is a broad, longitudinal, central blackish band, somewhat narrowing to the spinners.

Hab. Blumenau, Sta. Catherina, Brazil. On the leaves of various herbaceous plants, in little three-entranced, white, silken nests.

4. On the Attachment of the Eye-Muscles in Mammals.—I. Quadrumana. By W. Ottley, M.B., F.R.C.S., Demonstrator of Anatomy at University College, London.

[Received January 1, 1879.]

During the last six months I have been enabled, by the kind permission of Mr. Garrod, to examine the attachment of the eye-muscles to the sclerotic in a large number of the Mammalia. In some orders my observations have been as yet too few to enable me to generalize from them; but in the Quadrumana, where there has been a larger amount of material at my disposal, the variations in these muscles appear to be sufficiently well marked and characteristic to deserve a short record.

As a preliminary, I may state that, from the observations of Profs. Donders, Helmholtz, and others, it has been established that in man the six muscles are combined in the following manner:—

In turning the eye up, the superior rectus and inferior oblique act; in turning it down, the inferior rectus and superior oblique; directly inwards, the internal rectus; directly outwards, the external rectus.

In any intermediate position three muscles are used, thus:—

In turning the eye up and in, the superior and internal recti and inferior oblique; in turning it up and out, the superior and external recti and the inferior oblique; and so for the other movements.

The action of the individual muscles may be thus stated:—

The superior rectus (3)	turns the eye	up and in,
inferior rectus (3)	,,	down and in,
internal rectus (3)	,,	in,
external rectus (6)	,,	out,
superior oblique (4)	,,	down and out,
inferior oblique (3)	,,	up and out;

the numbers indicating the nerves which supply them.

It is also believed that a very slight rotation of the eye round an

Fig. 1.

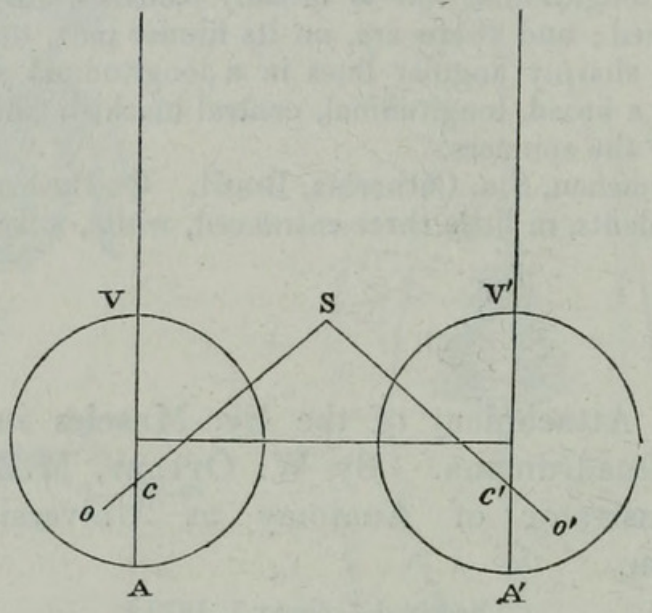
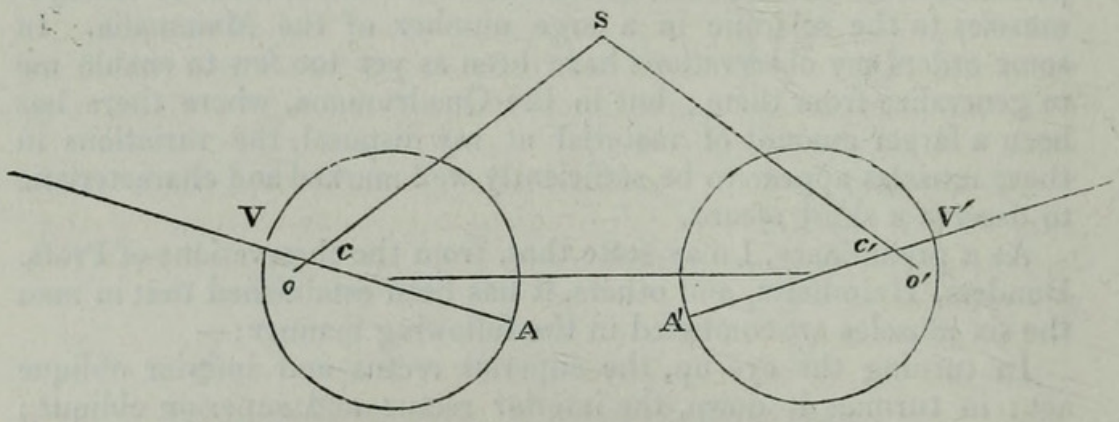


Fig. 2.



antero-posterior axis (the visual axis) does normally occur (Donders, Ann. d'Oculistique, 1877).

On examining the eye of a fish it is at once evident that the muscles here cannot have the same action as in the human eye. It is seen that here the superior oblique, which has no pulley, must be com-

bined, not with the inferior, but with the superior rectus; and the same disposition is found in all the Reptiles and Birds that I have examined. Not only so, but in some Mammalia, particularly those in which the eyes are placed at the side of the head, as in the Rodents and others, the muscles must be combined as they are in the fish or bird.

Professor Struthers, in a paper on the action of the oblique muscles (Monthly J. of Med. Science, Oct. 1849), has already drawn attention to the differences in the direction of these muscles which are found in the Mammalia, and has pointed out that the more the eyes are directed outwards, the more does the angle which the superior oblique makes with the visual axis tend to become acute.

The accompanying diagrams will explain this change in the angle.

Fig. 1 represents the visual axes V A V A′ parallel as in man; S O SO′ the direction of the superior oblique; the angle S c A is obtuse. In fig. 2 the axes are divergent, as in the Rabbit: the letters correspond; the angle S c A is acute. It will be noticed also that SO SO′ are directed to the front of the eye instead of to the back. This forward position of the superior oblique muscle, however, as will be presently shown, is not peculiar to those animals in which the eyes diverge.

Among the Quadrumana I have examined the attachment of the eye-muscles in the following genera and species:—

Fam. Simiidæ.—*Simia satyrus.*

Fam. Cercopithecidæ.—*Semnopithecus leucoprymnus, Cercopithecus callitrichus, C. albigularis, Cercocebus fuliginosus, Macacus inuus, Cynocephalus porcarius.*

Fam. Cebidæ.—*Ateles ater* and *A. melanochir, Mycetes seniculus, Cebus capucinus, C. hypoleucus, Nyctipithecus felinus, Saimaris sciurea.*

Fam. Hapalidæ.—*Hapale penicillata, Midas rosalia.*

And in the Lemures, fam. Lemuridæ, *Lemur*, sp.?; fam. Nycticebidæ, *Nycticebus tardigradus.*

In the human eye my observations agree with Sappey's description rather than with that of Henle; and I therefore give the measurements to be found in Sappey's 'Anatomie Descriptive,' and a diagram, to serve as a standard of reference.

The superior rectus is inserted $\frac{8}{25}$ inch from corneal edge. It is curved; and its outer is further from the cornea than is its inner edge.

The inferior rectus at a distance of $\frac{6}{25}$. (It is also oblique like the superior.)

The external rectus $\frac{7}{25}$.

The internal or median rectus $\frac{5}{25}$ to $\frac{6}{25}$.

The superior oblique $\frac{10}{25}$ (I should rather say $\frac{8}{25}$) from the optic nerve.

The inferior oblique $\frac{3}{25}$ from the nerve-entrance. The line of its insertion, if prolonged, would meet the optic nerve.

Neither of these authors refers to the curvature of the line of insertion of the superior oblique.

In *Simia satyrus* it will be seen that the attachments resemble

those described already, with the exception that the recti are placed further forwards.

The superior, inferior, and external recti are $\frac{5}{25}$ from the corneal edge. The median is rather nearer, $\frac{4}{24}$ inch.

Fig. 3.

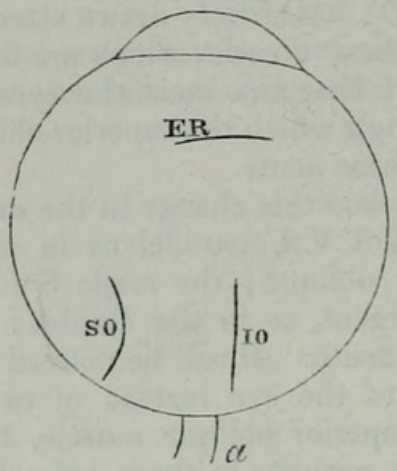


Fig. 4.

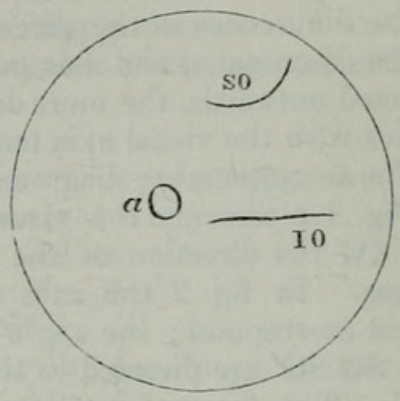


Fig. 3. A diagram of the attachments of the superior oblique, inferior oblique, and external rectus in the human eye, from the outer side.

Fig. 4. A diagram of the insertions of the superior and inferior oblique in the human eye, from behind: *a*, optic nerve.

The superior oblique is curved, but generally parallel to the optic nerve; anterior border $\frac{10}{20}$ from cornea, posterior $\frac{6}{20}$ from optic nerve.

Fig. 5.

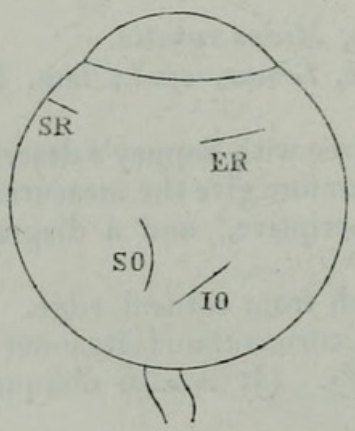


Fig. 6.

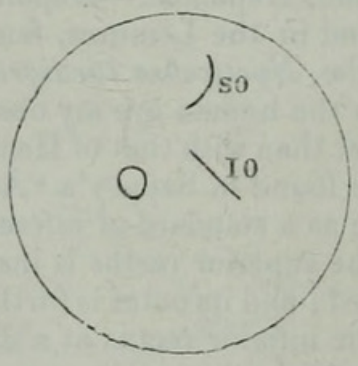


Fig. 5. A diagram of the attachments in *Simia satyrus*, from the outer side.

Fig. 6. From behind, to show the relative positions of the obliqui and the optic-nerve entrance.

The inferior oblique is higher at its inner extremity, which is $\frac{5}{25}$ from the optic nerve.

The optic-nerve entrance is $\frac{1}{4}$ inch nearer the inner than the outer edge of the cornea.

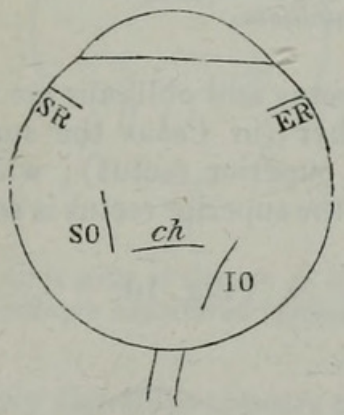
There is no choanoid muscle[1]; and the obliquity of the inferior oblique is remarkable.

In all the Cercopithecidæ, as, indeed, in all the Old-World Monkeys below the Simiidæ, there is a representative of the choanoid muscle, in the shape of a larger or smaller muscular slip, inserted between the superior and inferior oblique. In *Semnopithecus leucoprymnus* this slip was very small, the fibres were fattily degenerated, and no striæ were perceptible; but, at the same time, the atrophied remains were distinctly recognizable. In *Cercopithecus callitrichus* the muscle was even less distinct; there was nothing but a thin fibrous sheet, quite isolated from the capsule enclosing the sclerotic, it is true, and with an insertion corresponding to that of the choanoid slip in other members of this group; but microscopically no muscular fibres were found, only vessels and fibrous tissue remained.

In *C. albigularis* the slip was larger and contained distinctly striated muscular fibre, as also in *Cercocebus fuliginosus*. In *Macacus innuus* and *Cynocephalus porcarius* this muscular band was larger and very evident.

The differences between these members of the group with respect

Fig. 7.



A diagram of the attachments in *Macacus innuus*, from above and outside; shows the relative positions of the oblique muscles to one another and to the choanoid.

to the other muscles were slight. In all, the outer borders of the superior and inferior recti were posterior to the inner borders, while the median rectus was slightly nearer to the cornea than the external (as a rule).

In all, the anterior edge of the superior oblique was more distant from the cornea than was the posterior from the optic nerve, while the inferior oblique remained near the back of the eye. The optic-nerve entrance was always internal to the visual axis.

In the Cebidæ and Hapalidæ we have an important difference. The choanoid slip is entirely absent; even in the Marmosets I could

[1] This muscle, very seldom absent in the Mammalia, arises on the outer side of the optic nerve, is inserted into the sclerotic behind the recti, and is supplied by the sixth nerve; but its size and its attachment to the sclerotic vary much.

find no trace of it; but the superior oblique has now moved forward so as to be inserted close behind the superior rectus; while the inferior oblique still remains near the optic nerve, which still enters on the inner side of the fundus, though in *Hapale penicillata* it is only $\frac{1}{16}$ inch nearer to the inner than to the outer border of the cornea.

Fig. 8.

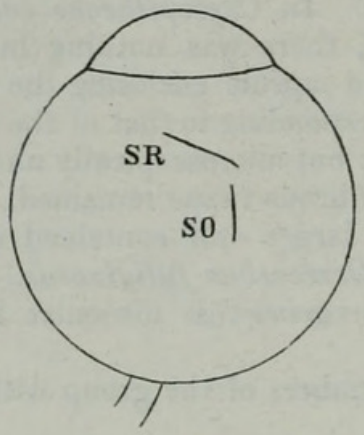


Fig. 9.

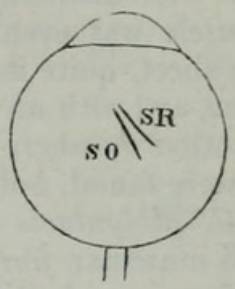
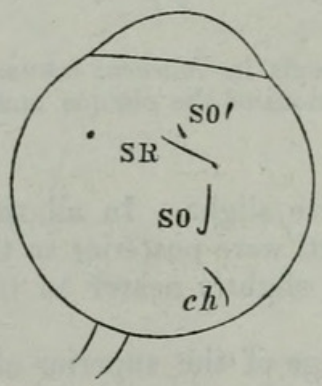


Fig. 8 is a diagram, seen from above, of the attachments of the superior oblique and superior rectus in *Mycetes seniculus*.
Fig. 9. Ditto in *Hapale penicillata*.

In the Cebidæ the rectus and obliquus are inserted almost at right angles with one another (in *Cebus* the superior oblique is quite at right angles to the superior rectus); while in *Hapale penicillata* and *Midas rosalia* the superior rectus is so oblique as to approach

Fig. 10.



A diagram, from above, of the eye of a Lemur; indicates the relations of the choanoid, superior oblique, and superior rectus.

the direction of the superior oblique; in these also the external rectus is very convex forwards.

There is no tapetum in any of the Quadrumana that have been examined.

In the Lemures the choanoid appears again as a distinctly muscular slip with the same relative attachment.

The superior oblique keeps its anterior position, the posterior border being nearly twice as far from the optic nerve as the anterior is from the cornea.

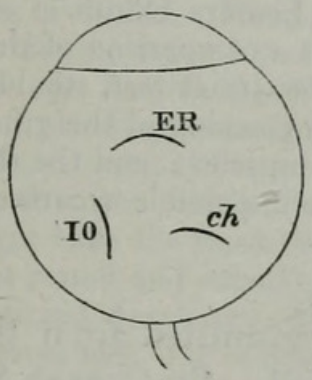
The inferior oblique has also moved forwards, so that in *Nycticebus* its posterior border is $\frac{3}{16}$ from the optic nerve, while its anterior is $\frac{5}{16}$ from the cornea. (In the Cebidæ it is often five times nearer to the optic nerve than it is to the cornea.)

In *Lemur* some fibres of the superior oblique are inserted in front of the superior rectus (*so'* in diagram).

The optic nerve is considerably to the inner side of the fundus.

In *Nycticebus* there is a further peculiarity in the superior oblique, in that it pierces the tendon of the superior rectus near its inner border to be inserted behind it.

Fig. 11.



A diagram, from the outer side, of the eye of *Nycticebus*; shows that the inferior oblique has moved further forwards.

The following summary therefore appears to be true :—

a. In the higher Quadrumana the muscles closely resemble the human muscles in their attachments, and, as was already known, there is no choanoid muscle.

b. In the Cercopithecidæ, besides other points of difference, there is always some representative of the choanoid. It is interesting to observe that in the higher families the muscle which may be supposed to be ceasing to be useful becomes degenerated and, at last, almost unrecognizable.

c. In the Cebidæ no trace of choanoid remains, but the superior oblique has moved forwards.

d. In the Hapalidæ the superior oblique has moved still further forwards, and changed its relation to the superior rectus, while the optic nerve has also moved outwards.

e. In the Lemuridæ the choanoid is again distinctly present, but the superior oblique has a different relation to the superior rectus, and either pierces it or is attached partly in front of it, while the inferior oblique is also moved forwards.

I may add that in a Bat (*Pteropus medius*) I found the superior oblique to have a relation like that in the Lemur to the superior rectus, but the inferior oblique was close up to the corneal limit.

It may be also proper to state that these variations in the muscular attachments do not appear to depend in any definite manner on alterations in the position of the orbit. M. Broca, in the 'Revue d'Anthropologie,' 1877, p. 356, gives a table of the obliquity of the orbit in members of the Quadrumana, this obliquity being determined by measuring the angle between the base-line of the skull (in his series the base-line chosen is the plane of the foramen magnum) and the axis of the orbit. This axis is a line passing outwards and forwards from the optic foramen through the centre of the orbital aperture. From this direction of the axis it will be seen (*a*) that it does not correspond with the visual axis, (*b*) that its obliquity is made up of an obliquity to the median plane of the head and of an obliquity to the horizontal base-line of the skull.

As instances of the great varieties found in this angle, he gives the mean angle in Orang as 45°·62, *Cercopithecus* 28°·43, *Cebus* 22°·3, *Mycetes* 67°·17, Lemurs 41°·05.

It seems possible that a comparison of the angles between the two visual axes when the eyes are at rest, would be more likely to afford some explanation of the meaning of the gradual change in the relative position of the eye-muscles; and the direction of these axes it appears at present to be impossible accurately to ascertain.

5. On some Birds transmitted from the Samoan Islands by the Rev. T. Powell. By Osbert Salvin, M.A., F.R.S.

[Received January 6, 1879.]

The collection, which contained specimens of the following five species of birds, was placed in my hands by Mr. Sclater, because there were two Petrels amongst them, a family of birds to which I have lately paid considerable attention. The skins were obtained by the Rev. Thomas Powell, of Faleatili, Upolu, Samoan Islands, during a visit to the islands of Tutuila and Manoa, the two easternmost islands of the group, and transmittted to Mr. Sclater, with a request that he would have them named. This I have endeavoured to do, but have only succeeded in finding names for three of the five species, the other two being apparently undescribed:—

1. Pinarolestes powelli, sp. nov.

Saturate brunneus, alis et cauda nigricantioribus; abdomine rufescenti-brunneo; rectricibus tribus utrinque extimis albo terminatis; rostro et pedibus plumbeo-corneis. Long. tot. 7·0, *alæ* 3·1, *caudæ* 3·2, *tarsi* 0·9, *rostri a rictu* 1·1.

Hab. Tutuila, Samoan Islands (*T. Powell*).

Obs. Sp. *P. vitiensi* affinis, sed major, alis et cauda saturatius brunneis.