A DEVICE FOR OPHTHALMOSCOPY IN DELPHINIDS

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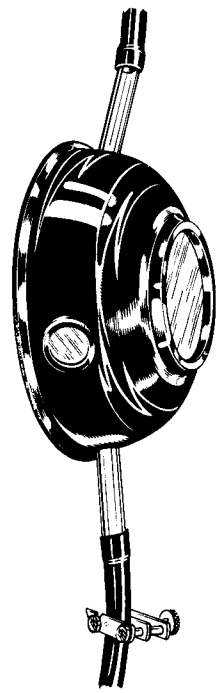
Ophthalmoscopy is a valuable technique in the diagnosis and the control of the course of a number of diseases, not only those which concern the eye itself, but also those which although located elsewhere, have a visible effect in the eye fundus (brain injuries, diabetes etc.). Therefore, the technique is commonly used by physicians and, as far as the patients allow for it, by veterinarians.

As in ophthalmoscopy the observed virtual image of the eye fundus is formed by the refracting media of the eye itself, i.c. by the cornea and the lens, the quality of these media. This will not lead to problems in terrestrial animals, their eyes being adapted to aerial vision well enough to meet the needs of at least a reasonable ophthalmoscopic practice. In such eyes the cornea is regularly curved and though there may be some astigmatism, as for instance in ungulates, it is for obvious reasons never so severe as to make useful vision impossible and, as a consequence, to make useful ophthalmoscopy impossible.

Under water the conditions are different. As the refracting indices of the corneal tissue and of water are in the same order of magnitude, the refracting power of the cornea is practically eliminated, leaving all the work to be done by the lens. With respect to vision, the curvature of the cornea is of no importance and, in cetaceans, seems to be more related with the streamlining of the body. It goes without saying, however, that as soon as an aquatic eye is lifted into the air (a technical necessity for the ophthalmologist as his instruments fail when submerged), the curved cornea will refract the passing light, adding its power to that of the unaltered lens. *Matthiessen* (1886, 1893) calculated that the cetacean eye, being practically emmetropic under water, is highly myopic and astigmatic in air (in which calculations the author obviously refers to vision in an axial direction). This makes ophthalmoscopy very difficult, if not impossible, the more so since we found that the corneal curvature shows small irregularities, perhaps caused by the flow of 'tears', but anyhow ruinous to any image. In the region of the recently described *(Dral,* 1972) emmetropic field of vision in air, a good image of the dorso-temporal part of the eye fundus can be obtained; however, the important area around the opticus papilla remains invisible.

The above obstacles are eliminated if the eye is kept under water, while the observer keeps his instruments dry. To this end we constructed a device, for the main part consisting of a rubber sucker-cup with a bottom diameter of about 12 cm, as obtainable at the plumber store. A wooden mould, fitting the inside, makes the cup available for manufacturing by a turning lathe. In the closed end

of the cup, originally attached to the handle, a rimmed hole was made, to fit a circular piece of plain-parallel glass with a diameter of 4 to 5 cm. a smaller (1,5 cm.) window was similarly mounted in the wall of the cup. Through holes on opposite sides of the wall two glass pipes, diameter 0,7 cm., were inserted, each elongated by a length of rubber tube.



When the open side of the cup is kept by hand on the skin around a dolphin's eye, the animal being supported by a hammock or in some other way, water can be syphoned into the thus formed compartment through one of the rubber tubes. If care is taken that the opening of the opposite tube is situated at the higher level, the air will escape, leaving the compartment completely water filled. A constant supply of water, to cope with any leakage, can be regulated at will with a stopcock in the inflow tube. If the cup is kept in place without movement and with stable pressure, the animal will soon open its eye and allow for ophthalmoscopy. As refraction by the cornea is eliminated, the eye is emmetropic and anastigmatic. A clear and undistorted image of a large area of the fundus, including the opticus papilla, can be obtained through the central window. The window in the wall of the cup should be used in the study of the peripheral parts of the fundus.

References

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