Simple method for auto-ophthalmoscopy

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SUMMARY

A technique is shown for self-examination of the fundi by means of an ophthalmoscope and 2 plane mirrors. The history of the subject is reviewed, showing that the process is unlikely to have a practical application.

Auto-ophthalmoscopy, the process by which one's own fundus can be viewed, is an old technique which has been subject to many slight refinements throughout the years.

Purkinje described 3 methods by which an impression of the vascular system could be obtained as far back as the 1820s (see von Helmholtz'). The reason why ordinarily we do not perceive the outline of our eyes' vascular system is because the 'shadow' image is suppressed. The best of his methods can be demonstrated with a pocket torch. With the eye closed the torch is moved rapidly backwards and forwards on the eyelid.

In 1856 Hermann von Helmholtz described his invention of the ophthalmoscope.¹ Even so, this instrument was not at first used in auto-ophthalmoscopy. Coccius² was probably the first to see his own retina rather than a shadowed outline of his retinal vessels. His instrument consisted of a blackened tube held to the eye. At the far end of the tube was a plane mirror with a small hole bored through the centre. A convex lens was placed within the tube. Pressing this instrument to his eye, and using a lamp 6 feet (1·8 m) away as a light source, he claimed some success.

Probably the most interesting and complex device for auto-ophthalmoscopic practice was invented by Heymann.³ He used a mirror, 3 convex lenses, and one prism. The arrangement can be seen in Fig. 1. The relationship between each optical piece could be altered so that many different areas of the retina could be viewed. As with the instrument of Coccius, an external light source was used. The advantage of this machine was that the viewed and viewing eye were not the same, unlike previous designs. This avoided the dazzle which must have occurred with Coccius's device. The instrument was manufactured under the name of 'Autoskop' by Dr Stokes, of Dresden.

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Fig. 1  Optical arrangement of Heymann's original auto-ophthalmoscope. L=convex lens. M=mirror. O=light source. P=prism. V=viewing eye. T=target eye. t₁, t₂=images of retina of T.
Since then the methods of auto-ophthalmoscopy have changed very little. The most useful addition to any of these procedures was the invention of the electric light bulb. Once these bulbs became a standard feature of the ophthalmoscope, auto-ophthalmoscopy was 'discovered' again, this time by Vianna4 in 1935. His method seems to have involved a similar optical arrangement to that of Heymann's with the difference that an ophthalmoscope is used as a more convenient light source. Leydhecker5 in 1936 described a similar method but used a pocket torch instead of an ophthalmoscope.

My own observations have shown that perhaps a more convenient method for anyone who is interested in looking inside their own eyes is to use an ophthalmoscope and 2 plane mirrors at right-angles. This somewhat limited method still gives a large enough field of view to encompass an area slightly larger than the optic disc. The eye using the ophthalmoscope will see the fundal image of the other eye straight ahead when positioned as in Fig. 2. This image is some way from the observer, its position depending on the distance of the eyes from the intersection of the mirrors and the separation of the observer's eyes. Thus the closer together the observer's eyes, the better the view. The observer must correct for the refractive errors of both eyes using the ophthalmoscope lenses.

Making the angle between the mirrors less than a right-angle will eventually bring the disc into view. The size of the disc image, once in focus, will not vary, as this image is at infinity. The optic disc is approximately 1·5 mm in diameter. Viewed through the ophthalmoscope it appears to be about a dozen times this size. This magnification is not a function of the ophthalmoscope (as the lens marked 'O' is in fact no lens at all) but a result of the magnifying power of the cornea and lens of the subject's eye.

As Leydhecker5 said in 1936: 'The uses of auto-ophthalmoscopy are questionable. When Heymann mentions that it is and will remain a necessity for all scientifically progressive doctors, one must remember that people often overestimate the value of their own thoughts and inventions. Up until now no record of any directly therapeutic act has resulted from the use of it. In spite of this, auto-ophthalmoscopy will always interest certain doctors.'

References
1 von Helmholtz H. Handbuch der physiologischen Optik. Leipzig. 1856.