fact, to which Wheatstone first called attention, that facsimiles also have a stereoscopic influence, in spite of the fact that the images retain their position on the retina unchanged. Numerous experiments show the same result, and it follows that even a change of the angle of convergence is not always observed as a change of depth.

There are two kinds of stereoscopic vision, direct and in­direct, according to' whether the point seen indirectly, *e.g.* H in fig. 3, is compared with the fixed point P, or with another point seen indirectly, *e.g. J* in fig. 3. In both kinds of stereo­scopic vision the exactness of the observation of the depth is greater as the point J approaches H, and the point H approaches P. As a matter of fact a man’s eyes are naturally never perfectly still. They move in their sockets, and the point P, where the axes intersect, is continually changing. Direct stereoscopic vision arises from indirect stereoscopic vision and vice versa, and the accuracy of the discernment of the depth increases and decreases. As in this the eye does not revolve round its lens but round the centre of the sphere situated 10 mm.

behind it, the entrance-pupil of the eye moves slightly to and fro and up and down, and many experiments have been made to produce a perception of depth for a single eye from the relative movements of the images consequent on this motion. As these movements of the images only occur in indirect vision, it can be understood they are not seen by most people. This, however, cannot be regarded as an actual perception of depth, because these viewings necessitate a consideration for each individual interpretation, which is quite foreign to stereoscopic vision.

Indirect stereoscopic vision is of great importance. It makes it possible to recognize any sudden danger or obstacle outside the direction in which one is looking. Even with the stereo-telemeter (see below) the position of the range through which, for example, a bird flies, could not always be accurately given, if one were solely dependent upon direct stereoscopic vision. If the attention and eyes are directed upon a certain object, as, for instance, in manual labour and in measuring the image­space with the so-called “ travelling mark ” on the stereo-comparator, then direct stereoscopic vision only is concerned.

Stereoscopic vision is in many ways similar to the monocular observation of a preparation under the microscope, and yet there is a great difference. In an unchanged focused micro­scope it cannot be distinguished which of the indistinct objects are above and which are below the plane focused for. In stereoscopic vision, however, this can he seen directly. How does this happen? Why does the point H in fig. 3 appear behind and the point V in front of the point P when both eyes are fixed on the point P?

As is shown in fig. 3 the image-points on both sides lie further apart for H or nearer together for V than the image-points for P, and for all the points on the horopter (Q1 R1 S, T &c.), whether the points H and V are situated inside or outside the horopter. In other words, if the point H be formed in the object-space by the moving of the related points Q (or R) towards H, then a movement of the image-point takes place in the right eye (or the left), in both eyes in the direction of the nose, so long as the point H is outside the horopter. On the contrary an external movement of the image-point, *i.e.* towards the temples, takes place when the points S and T are substituted by the point V situated inside the horopter. This differentiation of the retinal images of the points H and V respectively inside and outside the horopter must suffice, and the question as to how the idea of space is conveyed to the brain is a physiological and psychological subject.

If the images of the line PH in both eyes (or of the line PV) are very different in length, the double images of the point H (or V) are seen without great attention. But the stereoscopic effects are in these cases always the same as before. There is, however, an exception in which the observer sees only two images and in which stereoscopic observation is completely excluded. This exception is important because it occurs in the space in the immediate proximity of P. If for example the second point (H' in fig. 3) is situated behind or in front of the point P, so that it falls between the two optic axes or on one of them, then only double images can be seen, either of P or of H', according to whether the optic axis cuts at P or H', or double images of both points if the optic axes intersect at any other point of the line PH', but the representation of the difference of depth of the two points P and H' is never obtained.

This fact can be easily realized if a stick, *e.g. a* lead pencil, be held before the eyes of an observer with good stereoscopic sight so that its lengthwise axis falls exactly on a point between the eyes or in the middle of one of the two eyes. The double images can be seen still more clearly if two small balls on thin threads are suspended behind one another so that their connecting line retains the position mentioned above. In this experiment it can be seen directly how inconvenient these double images are to the observer. He involun­tarily tries to evade them by moving the head. The reason for this is that, when P (or H') is fixed, the images of H' (or P) are always separated from one another by the centre of the yellow spot. The distances of the two images from the yellow spot have consequently opposite signs, whilst for all other objects *(e.g..* H) which lie outside the two axes the distances have the same signs. The difference of the sign is, however, not alone decisive, for if the connecting line PH' is moved a little higher or lower out of the plane FPF the signs remain different, but the stereoscopic effect is immediately regained. Therefore in all cases in which the connecting line PH' is seen with one eye as a point and with the other as a line, or with both eyes as a line, but from two diametrically opposite sides, there is no stereoscopic effect, but double images are seen; and that for stereo­scopic observation it is essential to see the connecting line PH' *•with both eyes simultaneously from one and the same side,* from above or below, from the left or the right. This condition is provided for in the stereotelemeter by the arrangement of a zigzag measuring scale, so that the connecting-line of the marks slightly ascends. Care must be taken when using this instrument (as also when using any stereoscopic measuring instrument) that the index hangs close to or above the object to be measured, so that the latter is only touched and in no way covered by the mark.

The power of perception of depth in man is most accurate. This has been ascertained by the approximately equal keenness of vision of all normal-sighted people and by the interpupillary distance. The angle which serves as a measure for the keen­ness of vision is that under which appear two neighbouring points of the object-space which are still seen by the single eye as a double point; according to the older experiments of Helm­holtz, this angle is about 1'. When measured on the retina the keenness of vision is determined by the diameter of the nerve filaments situated in straight rows close to one another in the fovea (fig. 4). The diameter of these filaments amounts to roughly 0∙005 mm., or in angular measure 1'. More recent experiments for keenness of vision and power of perception of depth have given considerably higher values (Wülfing, Pulfrich, Heine and others); thus Pulfrich in 1890, when first introducing