shows that it refers to the particular conditions of the experiments. It continues: "on the contrary, where they [the rods] are present in fair numbers, the colour of the violet test field vanishes"[1]. This fact is not explained, or even mentioned, by Thomson. It was, however, the crux of the argument.

It is by no means certain that, as suggested by Thomson, the rods were always stimulated to some extent in the experiments mentioned. As can easily be verified, the use of a 2 mm. artificial pupil reduces in a striking way the effects of aberrations of the eye in what concerns the spread of the retinal image. Since the experiments were made at threshold intensities, moreover, it is likely that only the brighter, central part of the retinal image of the field was actually able to stimulate receptors. The field, when seen, appeared as a well-defined small area. All this makes it improbable that rods were stimulated when the field was presented at an angle of 0·15°. (When the light falls in an area containing a certain number of rods, as presumably happens at an angle of 0·75°, the cone threshold may still be lower than the rod threshold if the field is small and if spatial summation in the rods takes place only to a small extent.)

Even if it were proved, however, that the rods were always stimulated in the experiments discussed here (using the dark-adapted eye), the fact remains that the presence of many rods, as observed in parafoveal vision, is highly *detrimental* to blue or violet vision. In brief, therefore, when an area containing many rods is stimulated with violet light, no colour is seen; and, in some of the cases where colour is seen, it is at least doubtful whether any rods are stimulated. These observations seem incompatible with Thomson's suggestion that the reason why (in my experiments) the light appeared coloured by foveal vision is that it spread on to parts of the retina which contain rods. (The mechanisms active under conditions other than dark adaptation are not discussed either in the original paper or here.)

The bibliography given in my paper makes it clear that there was no claim to originality in the type of experiments described. They were made largely because Wentworth[3] in her extensive investigation (which is more recent than Gotch's[4] and more like my experiments) had found in the central area of the retina an achromatic threshold which is lower than the chromatic threshold. This was not found in my experiments. Differences in the conditions used account in a general way for the different results obtained.

Thomson reports an experiment from which he seems to conclude that the rod-free area is completely insensitive to violet light, and which he gives as a demonstration of the 'blue blindness' of the fovea noticed by König[5]. What König meant by this 'blue blindness' is a certain type of dichromatism "which, however", in König's words[6], "by no means implies complete insensitivity to light of short wave-length". This is obvious, for König states[7] that he was able to match all spectral colours with mixtures of 650 mμ and 475 mμ in the fovea, which implies that the latter wave-length is able to stimulate the fovea—and that the stimulation it produces can be confined to the receptors contained in this area. It is therefore possible that, if the violet light used by Thomson was not seen by foveal vision, it was because the light was not sufficiently bright.

According to König's data, the centre of the fovea is dichromatic. According to Young's theory, it is therefore a two-receptor system. But it is not clear whether the more peripheral parts of the rod-free area, in which the cones are somewhat different anatomically from those of the "bouquet central"[8], are dichromatic or trichromatic. It seems that the discussion cannot be carried much further before this point is settled.

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[5] König, A., "Gesammelte Abhandlungen zur Physiologischen Optik" (Leipzig, 1903).
[6] König, A., *loc., cit.* 396.
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Persistence of Vision

PERSISTENCE of vision is the basis of the cinematograph, but there is no persistence of vision when the eye is moved in ordinary circumstances. If there were, reading would be a difficult and slow process. This is explained by the double function of the ocular muscles, the decomposed photochemical products being pressed in the direction in which the eye moves, beyond the fixation point.

There is another form of persistence of vision, namely, that of positive after-images. If a strip of white paper 3 in. × ¼ in. be placed on a sheet of black cardboard, in a good light, and viewed for the shortest possible time, and the eyes then closed and covered with the hands, a clear-cut positive after-image of the paper will be seen, which will gradually fade away without becoming negative. If the eyes, being closed and the positive after-image clearly visible, are moved to the right, the whole after-image will appear to move to the right, past the fixation point. It will also bulge towards the right. These observations can be explained on the view that the photochemical stimulus in vision is in liquid form, and that the cones are stimulated indirectly by these products, and not by the direct action of light.

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Classification and Nomenclature of Animal Behaviour

MODERN work on the simpler forms of behaviour has gained much from the classification of reactions into different types. Its main achievement has been the separation of kineses from taxes. Fraenkel and Gunn have brought order into the subject with their book, "The Orientation of Animals: Kineses, Taxes and Compass Reactions" (1940). The following criticism is offered in the belief that they have provided a valuable point of departure for future work.

The authors argue (p. 22) that "When activity results from high intensity or concentration of the stimulus, it should be called *high kinesis*, and when it results from low intensity or concentration, it should be called *low kinesis*". There is a weakness