A Demonstration of Color Fatigue of the Eye

Frank L. Verwiebe

Eastern Illinois State Teachers College, Charleston, Illinois

The sketch of Fig. 1 below shows a simple arrangement of apparatus which demonstrates the color fatigue of the eye in an effective and striking manner. A description of it is given by Sir William Bragg.[1] It can be assembled very readily using the ordinary friction drive rotator, a colored lamp, a white reflecting lamp, and a piece of cardboard properly cut and painted as indicated in the sketch.

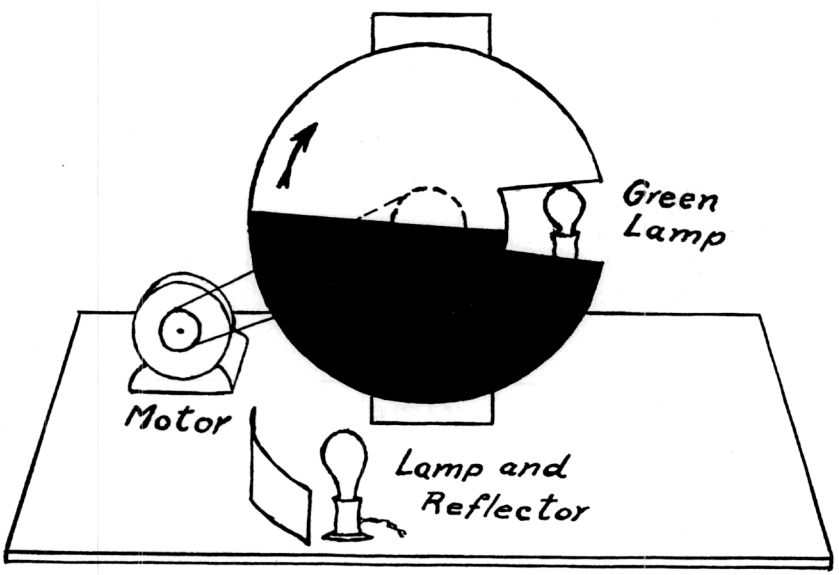

Fig. 1.

If the disk is rotated in the direction shown the eye first receives green light from the green lamp, then white light from the white half of the disk, then a rest during the passage of the black portion, and so on as the disk revolves. At a rather low speed of rotation it is observed that the green lamp appears to be reddish in color instead of green. If the direction of rotation is reversed so that the eye has time to rest between being stimulated by the green lamp and then the white light we see the green lamp in its actual color, green. The apparent change of color of the lamp as the direction of rotation is reversed is striking in effect and curious to behold.

[1] Wm. Bragg, *The Universe of Light,* Macmillan, N. Y., 1933, p. 101.

An explanation of this phenomenon may be given in terms of some of the sensation characteristics of the eye as described in detail by Luckiesh.[2] Fig. 2 indicates in an approximate and general manner the growth and decay curves of the eye sensations as the disk is rotated clockwise. During the time that the green lamp is exposed the eye receives a green stimulus. The sensation of green according to the experiments described by Luckiesh rises from zero to a maximum and then diminishes, when the portion of the

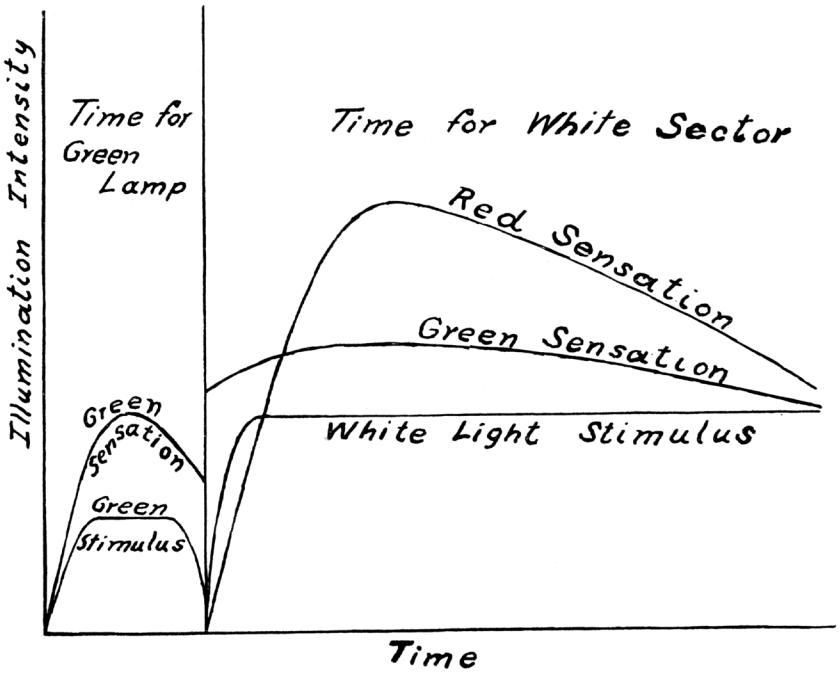

Fig. 2.

retina responsive to green may be said to be fatigued. When the stimulus of white light next arrives, which light we will for simplicity's sake assume to contain approximately equal portions of the complimentary colors red and green, and both of greater intensity than the green lamp, the sensation of red will be greater in intensity than that of the green because of the fatigued state of the retina in respect of green. By virtue of the retinal inertia the total sensation effect will be the time integral of the various color sensations. The sum total of the area under the green curves can be seen to be less than the total area under the red curve. The net effect will then be a sensation in which red predominates. Corresponding effects are obtained with red and blue lamps.

[2] M. Luckiesh, *Color and its Applications*, D. Van Nostrand, 1927, p. 138.