

observed in the latter condition, and the other signs of incompetence of the valves have not been encountered.

Practically at once in many cases of nephritic edema, dye streamers become visible extending from the injected region. In every instance they have appeared far sooner, and lengthened much more rapidly than in any normal instance. Within 3 or 4 minutes they have the appearance assumed after 20 minutes to half an hour in the normal human being. Lymph flow is obviously far more rapid than usual. Its rate as judged by streamer formation, varies with the changes in the patient's condition. Streamer formation was least when edema was increasing, but still much more than normal. It was still greater in the stationary periods and greatest by far in periods of diuresis. At these times one or 2 colored streamers developed that extended from the ankle to Poupart's ligament within 15 minutes after an ankle injection of only 0.02 cc. of dye solution in a leg lying horizontally or even extended against gravity to the knee in a leg hanging vertically. Such findings have never been observed in normal individuals.

Lymph flow is excessive in the edematous skin of the nephritic patient. In cardiac edema on the other hand there is a virtual stagnation of the lymph.

8019 P

Relation of Entoptic Stray Light to Flicker and the Perception of Movement.*

S. HOWARD BARTLEY. (Introduced by Geo. H. Bishop.)

From the Oscar Johnson Institute, Washington University, St. Louis.

Under certain conditions, flicker is seen in the visual field surrounding the test-object, presented against a dark background, when this object subtends only a small visual angle. Unlike flicker in the test-object itself, field flicker has received little or no study. It appears when the test-object is very bright, or large, or when the flicker of the test-object is much below its critical fusion frequency. The question arises whether the phenomenon is due either to some sort of neural interaction, or to entoptic stray light. Recently considerable evidence has been adduced to make it entirely

* This work was done under a grant-in-aid for Research in Neurophysiology from the Rockefeller Foundation.

probable that it arises from the latter source. To determine this conclusively, 2 tests were made. Using monocular vision and locating the image of the test-object on the "blind spot" where no neural interaction can take place, field flicker was not abolished. On the other hand, when 2 test-objects equal in all respects are alternately presented on 2 different parts of the visual field, the first disappearing as the second appears, thus keeping the stray light constant, field flicker is abolished, demonstrating its dependence upon actual intermittent illumination rather than upon neural interaction between parts stimulated and those not.

The relation between the critical flicker frequencies of the test-object and the surrounding field was measured under a variety of conditions. With areal increase of the test-object, the c.f.f.'s of both test-object and the field were raised in such a manner as to indicate some interaction between the 2 areas. With increase in intensity, the c.f.f.'s of both were at first raised till a point was reached at which the c.f.f. of the test-object began to fall, so that with further increase in intensity the c.f.f.'s of the 2 areas became identical. Finally the c.f.f. of the test-object became even lower than that of the field. This was true for both foveal and peripheral vision.

When flicker is slow, intermittency of illumination is not the only characteristic of the stimulus but the perception of an apparent alternate expansion and contraction of something within the visual field is added. The test-object first suddenly comes into existence and then expands to its final size, this perceived movement being known to psychologists as *gamma* movement. The present study has shown that it is not confined to the test-object as usually implied, but like flicker occurs also from stimulation by entoptic stray light. In more adequately defining the distribution of light on the retina, a basis for this form of "apparent" movement has been provided in terms of successive response of different parts of the retina which is also essentially the basis for the perception of "real" movement.