

whereby electrodes are attached to the skin, recording changes in potential between the retina and the cornea. The reader who has not done experimental work in this field will be impressed by the ingenuity and technical detail involved in such experiments.

The authors then turn to their own technique, which is a continuous record of eye movements by means of electrodes attached to the skin near the eyes. Lateral movements of the eyeball and, in the vertical direction, blinking are recorded. Records of heart rate (electrocardiogram) and brain waves (encephalogram) were taken simultaneously. The experimental design covered a number of interesting points. The subjects sometimes read an interesting historical novel and sometimes a dry economic treatise, both in book form and on microfilm. About every 25 pages in one series they were given a comprehension test which was designed primarily to maintain motivation. In other series, they did not have this motivation.

The results are analyzed in great detail—"miles of polygraph records." Especial attention was given to the number of fixations, the number of lines read, the number of blinks, and the number of regressions in the eye movements. A number of findings stand out as of particular interest. One is that the normal subject can read continuously for 6 hours without undue signs of fatigue. This applies also to microfilm and should answer the frequent qualms in that respect. High school and college students showed the same trend. The authors speculate as to the reason for this finding and hint that the intermittent operation of the ocular musculature may allow for adequate recuperation, just as the heart muscle recuperates between beats. There is a further hint that this may be partly due to training, much as an athlete gets in "condition." Particularly interesting is the contrast between the subjects who were well motivated and those who were not. In the main experiment, the periodic comprehension tests served very definitely a motivational purpose and apparently forestalled any pronounced decrement in performance. The authors conclude by attributing visual fatigue in reading primarily to this motivational factor. At least, the first index of fatigue is in these alterations of attitudes and general feelings and not in a breakdown of the sensory neuromuscular mechanism. From the educational standpoint, it would appear that, with adequate motivation, persons could read for prolonged periods without any appreciable decrement in efficiency. This has obvious bearing on academic schedules, study periods, and the like.

A great many of the original data are summarized in tables in the appendix, and there is a bibliography of over 400 titles. On the whole, the work is thorough, the historical material will be useful to persons who are contemplating undertaking any research in this field, and the conclusions regarding length of reading periods and particularly the motivational aspects should be of considerable interest to educators.

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