

DIRECT CONTROL OF THE RETINAL FIELD

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There are not a few problems in experimental psychology—and some of these by no means the least interesting and important—which require no apparatus and comparatively little expenditure of time. Among such, one was brought prominently to my notice several years ago while endeavoring to discover how far visual dreams depend upon the arrangement of the light- and color-spots in the retinal field. (See *Mind*, Second Series, No. 1.) As, at first, an incidental affair, I then found out that their arrangement could, in my case at least, be brought under control of the will. This power grew rather rapidly with continued practice. That is to say, I was soon able, by attentively willing for perhaps some three to five minutes, to cause a cross, or a circle, or two concentric circles, or some other simple figure, to appear in the retinal field.

I have recently been experimenting with a class of sixteen advanced students—three seniors and the remainder graduate students—to see whether this power of control over the retinal field is at all common. The results have been exceedingly interesting and, in some respects at least, decisive. Let it be understood that all these experimenters understood the problem perfectly well and, having studied psychology from two to six years, were quite competent to answer it intelligently. What they were asked to do was briefly this: to close the eyes, allow the after-images completely to die away, and then persistently and attentively *to will* that the color-mass caused by the *Eigenlicht* should take some particular form,—a cross being most experimented with. They were to notice the effects of time and fatigue, and were also to see whether the

color as well as the form of the object thus willed was at all under control. It should be borne in mind that here was no question of the effects merely of imagination, or of visual hallucinations projected into space. The primary question was, *Can the retinal sensations which arise with the eyes closed and motionless be made to respond to volition with respect to the form and color which they assume?*

The results obtained were as follows: Of the sixteen persons experimenting with themselves, four only reported no success; nine had a partial success which seemed to increase with practice and which they considered undoubtedly dependent directly upon volition; and with the remaining three the success was marked and really phenomenal. It should be said, however, that of the four who reported 'no success,' only one appears to have tried the experiment at all persistently.

The nature of the partial success attained by nine of the class can best be understood by quoting from my notes of the reports made to me. Miss C. at first had no success at all. But by persistent trying, lines corresponding to the limbs of a cross began to appear in the retinal field; and once she got a complete cross. This experimenter thinks that her failure at first was largely due to looking too near; for several times, after she had tried in vain for some minutes, the limbs of the cross would suddenly start up in the distance, as it were. Miss C—n succeeded two or three times in getting the vertical bar of a cross which would remain for a second or two, then scatter, and then gather again. Mr. M., too, not infrequently succeeded in getting the vertical bar, but could only get the horizontal bar in a 'flickering' way; and then, while he was trying to make it lie over the other stationary bar, it would disappear. In his case the effect of fatigue in diminishing success was quickly apparent. Mr. S. also succeeds invariably in getting the vertical bar of the cross, but finds the horizontal bar more coy and flickering. The color of the figure in his case is uniformly light at first, and then changing to dark.

Mr. M—y reported that at first he could do nothing in the way of making the desired cross appear. But by persistent

effort he soon succeeded in making two complete dark crosses arise in the retinal field, one of which he thought he traced to the retina of each eye. A yellow upright cross with a short horizontal bar, on one occasion, started up at apparently about two feet distant. Mr. C. also, on practice, could produce at will a perfect cross, with the vertical bar darker, which would after a brief time disappear and then reappear with the bars of a complementary color. Mr. D., like several of his colleagues, had on the first trial no success whatever. But, on the second trial, he by persistent willing developed a vertical bar which remained stationary; while the required horizontal bar, although it appeared to order, persisted in sliding up and down the vertical bar. The third time, however, he got a perfect square cross which finally changed to an X shape. He could also obtain a circle at will. This experimenter found that, to obtain the best results, he must not be fatigued by more than five to seven minutes of trial; and that frequently the desired image 'jumped' into being all of a sudden when he was about to cease trying. Of the three others who had a partial success, one could sometimes get the vertical bar; another could get both bars separately, but could not get them to cross; and the third could generally get an upright and perfect cross within three minutes of beginning to try.

I have reserved the three most remarkable cases for a somewhat more detailed statement. Of these three Miss S. is very extraordinary in her control over the *color* of the object produced at will; her control over the shapes is less complete. An unusual color-sense appears, indeed, to be congenital in the family, having been possessed by the father and several of the children. This includes the power to match very delicate shades of color, almost infallibly, by memory. At first Miss S. obtained only a 'flickering' cross; but after trying daily for several days, she became able to get this figure, or a circle, every time at will. The period ordinarily required for the complete control of the effect was from ten to twenty minutes of as steadfast willing and waiting as was possible. Then at least one particular form of a cross could be got, at will, in all the principal colors *except red*. The violet and the purples were, however, easiest to obtain. An intensely bright but not

a dark blue could always be got; the green, on the contrary, was always dull, and the yellow and orange imperfect and tinged with brown. The violet cross was especially brilliant and seemed to start into the field suddenly, after the requisite period of trying. At my suggestion, the eyes on being opened after these voluntary crosses were obtained were immediately focussed on a sheet of white paper, and the cross found to appear on the paper in the complementary color.

Mr. B—r is also somewhat unusual, not to say abnormal, in his powers of vision. His eyes have some defects, especially in localizing promptly and correctly. His success is best at night, when a perfect cross or circle can readily be produced at will. The color-mass which the volition arranges into this shape is usually of a grayish color. The form generally appears to be located very near; but it may at will be set at a great distance, and then the cross appears as though seen through a long tube. Upon the cross a circle can be projected at will, which is usually best secured when the intensity of the color-mass is 'moderate.' This circle can then, by somewhat persistent willing, be separated from the cross and located near the bottom of the vertical bar on either side, but with varying degrees of difficulty.

A square cross is generally selected as 'most pleasing'; but the cross can be made to assume the figure of an X. This experimenter noticed that the strong light from a gas-jet falling on closed eyes is not an uncontrollable color-mass; but a definite brilliant cross can be planted within it by an act of will. Mr. B—r finds that the effect of fatigue is to make the cross persistent in the retinal field; and this effect is sometimes so marked that he is obliged to open his eyes in order to dispel it.

Mr. D—s, who has studied art considerably, has a very vivid color-sense. He can produce a perfect cross, of various forms and colors, at will, almost instantly. He, too, like Miss S., found the complementary color appearing on a white background upon opening the eyes. The cross 'has a tendency' to appear in red of a very intense and brilliant hue (the complementary color was described as a 'very bright silvery blue'). So strong is the effect of gazing at this voluntarily

produced figure that the experimenter feels an almost irresistible tendency to vertigo, and can sometimes scarcely avoid losing consciousness. The colors of the cross are apt to run through the order of red, orange, yellow, green, and blue. They can be arrested by opening the eyes; and after closing the eyes again, they can be made to begin at any point in the series. Mr. D—s thinks the emotional conditions have a great influence on the result. He also finds his eyes in a condition of strain, and the result of fatigue with him is to make the images grow fainter and fainter. His testimony is that he has thus seen crosses of all shapes, sizes, and colors; and apparently he has no difficulty in their construction at will.

I leave this very interesting and, I think, fruitful subject with others to continue the experiment, after noting two or three particulars. One trivial circumstance is that the vertical bar of the cross seems much the easier to produce and to hold steadily in the retinal field. Again, all the experimenters are agreed that the phenomenon is one of *will*, and that the power grows somewhat rapidly with practice. None of them—with the exception, possibly, of Mr. D—s, who speaks of a feeling rather of muscular 'strain'—experience in the production of these images any movement of the eyes. The effect of fatigue seems to vary somewhat; while with most it impairs the result, we have seen that it may operate with one experimenter to make the images disagreeably persistent.

Finally, I venture to affirm—at least in a tentative way—that we have here an experimental demonstration of the unique and inexplicable power of the volition of the ego to induce changes in the cerebral centres and the connected organs of sense,—and in this case, apparently, without any use of the muscular system to control the nature of those changes.