

On Negative After-Images with Pure Spectral Colours.

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(Received October 17, 1912,—Read January 16, 1913.)

In a paper "On Negative After-Images and Successive Contrast with Pure Spectral Colours," by Mr. A. W. Porter, F.R.S., and Dr. F. W. Edridge-Green,* the authors describe certain experiments, which they consider impossible of explanation on either the Hering or the Young-Helmholtz theory of colour vision.

In justice to Thomas Young, it is only fair to point out a discrepancy between the title of the paper and the experimental conditions therein described, viz.: "The method adopted was as follows: In a dark room, *in which, however, there was a certain amount of stray light*, a horizontal spectrum, as pure as possible, was projected on a screen. A portion of the retina of one eye was then fatigued by rigidly gazing at a portion of another spectrum, isolated in the Edridge-Green colour-perception spectrometer. . . . After the fatiguing light had been viewed for about 20 seconds, the eye was turned to the screen, so that the after-image formed a band running right across the spectrum on the screen and occupying its centre."

The italics are mine. It is impossible too strongly to emphasise the fact that a spectrum projected in a room, "in which there is a certain amount of stray light," cannot be regarded as consisting of pure spectral colours.

The phenomena recorded can all be explained when the stray light is taken into account, and they agree perfectly with Young's theory. Moreover, they are familiar in laboratory practice. Thus, in paragraph 1, the effect of red light on the blue and violet, rendering these darker and bluer along the line of the after-image, is easily understood if we regard these colours as contaminated with white, the red element of which is removed by the fatigue.

In paragraphs 6, 7, 8, and 9, the fatiguing ranges were orange-yellow, yellow-green, blue-green, and blue as far as $\lambda 475$, and the after-images are said to have been purple, evidently by admixture with the violet of the stray light. But in paragraph 10, with fatiguing light $\lambda 445$ – $\lambda 455$, the after-image was yellow-green—clearly because the violet of the stray light was cut out by fatigue.

In paragraphs 16 to 20, experiments of a more complex character are described, all, however, capable of explanation in accordance with Thomas Young's theory, if the stray light is taken into account. This part of the

* 'Roy. Soc. Proc.,' 1912, B, vol. 85, p. 434.

paper ends with the words: "No matter what portion of the spectrum was selected, the after-image, where it crossed the spectral band, was seen as a grey square." That alone is sufficient to demonstrate the presence of stray light.

Under the head of Conclusions, the authors state that "the negative image is much darker, more difficult to produce, and more evanescent in the absence of all external light as when black velvet and the hands are placed over the eyes. It is obvious, therefore, that external light has an influence on negative after-images." I have used almost these identical words in lecturing on this subject any time these 15 years. But I have quoted them from the papers of Robert Waring Darwin, which are printed in the 'Philosophical Transactions' for 1786, and were undoubtedly made use of by Young in formulating his theory.

It is difficult to understand how anyone can expect to find acceptance for his bare statement, that "it is impossible to explain these facts on the Young-Helmholtz theory of colour vision."

I have described in my paper "On the Relation of Artificial Colour-Blindness to Successive Contrast"* various methods of observing the phenomena of successive contrast with really pure spectral colours, using stimuli no stronger than those employed by Mr. Porter and Dr. Edridge-Green. My results are different from theirs, and are in all respects quite in accordance with the theory expounded by Thomas Young.

It is a matter of everyday demonstration in the laboratory that, using moderate stimuli, with persons of normal colour sensation, yellow does change to green after fatigue to red, and to red after fatigue to green. And I am bound also to note that persons whose green sensation is weak fail to see this change in the colour of yellow after fatigue.

* 'Roy. Soc. Proc.,' 1900, B, vol. 66, p. 206.