

[From the Proceedings of the Physiological Society, 19–20 September 1975
Journal of Physiology, 254, 66–67 P]

Transient tritanopia: evidence for interaction between colour mechanisms

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If the eye is adapted for some time to light of long wave-length and the adapting field is then turned off, the threshold for the blue-sensitive mechanism of the eye does not follow the normal dark-adaptation curve but actually rises. This remarkable observation, reported in 1949 by Stiles, has been neglected and doubted. We have re-examined the phenomenon because it may reveal an important interaction between the cone mechanisms of the retina.

We find that 400 msec after a yellow (580 nm) field has been extinguished the threshold for detecting a blue (445 nm) test flash may be thirty times higher than it was when the field was present. The threshold remains elevated for several seconds. The effect is found for fields producing retinal illuminances of from 10 to 10^5 td. It is not necessary to extinguish the field: an attenuation of 1.0 log unit is enough to cause a marked loss in sensitivity to blue targets. We have not so far found analogous effects with short wave-length adapting fields and long wave-length targets. The suppression with yellow fields appears to be confined to the blue-sensitive mechanism and we provisionally term the phenomenon *transient tritanopia*.

Does extinction of the field exercise its effect directly on the blue-sensitive cones or do the recovering long wave-length receptors inhibit, or otherwise interfere with, the blue cones? To distinguish between these two classes of explanation, we adjusted a green (525 nm) field until, in the steady state, it raised the threshold for the blue cones by the same amount as did a yellow (580 nm) field of $-1.36 \log \text{ erg sec}^{-1} \text{ deg}^{-2}$. We then presented 445 nm target flashes at varying delays after we had switched from the yellow field to the green. The transition between the yellow and green fields should not be detectable by the blue cones; but the threshold rises as before. Thus transient tritanopia must represent a strong inhibitory interaction between cone mechanisms.

This work was supported by the M.R.C.

REFERENCE

STILES, W. S. (1949). *Documenta ophth.* 3, 138–163.