

---

## **LUMINOUS EFFICIENCY, CONE FUNDAMENTALS AND CHROMATIC ADAPTATION**

Andrew Stockman

*UCL Institute of Ophthalmology, London, UK*

Photopic luminous efficiency,  $V(\lambda)$ , is typically defined as a fixed linear combination of the L-cone and M-cone fundamentals. It is well known, however, that photopic luminous efficiency functions are not fixed in spectral sensitivity, but change with chromatic adaptation. We have investigated these changes by measuring 25-Hz heterochromatic flicker photometry (HFP) matches in six genotyped male observers on 21 different 1000-photopic-troland adapting fields: 14 spectral ones ranging from 430 nm to 670 nm; and 7 bichromatic mixtures of 478 nm and 577 nm that varied in luminance ratio. Each function was analyzed in terms of the best-fitting linear combination of the long- (L) and middle- (M) wavelength sensitive cone fundamentals of Stockman & Sharpe (2000). Taking into account the adapting effects of both the backgrounds and the targets, luminous efficiency on backgrounds between 603 nm and 535 nm could be predicted by a simple model in which the relative L- and M-cone weights are inversely proportional to the mean cone excitations produced in each cone type multiplied by a single factor, which was roughly independent of background wavelength (and may reflect relative L:M-cone numerosity). On backgrounds shorter than 535 nm and longer than 603 nm, the M-cone contribution to luminous efficiency falls short of the proportionality prediction, but for different reasons in the two spectral regions.