

Effect of the peak sensitivity wavelength of the photopigments on object colour

Logvinenko, A. D.

Department of Vision Sciences, Glasgow Caledonian University, Glasgow G4 0BA, UK

Absorption spectra of cone photopigments peak at different wavelengths for normal trichromatic individuals. How does this variation in spectral positioning of photopigment peak sensitivity affect objects colour appearance? This issue is addressed from the theoretical point of view using a new colour space for object colour reported at the ICVS2007. This space is based on a set of rectangle spectral reflectance functions which make a complete colour atlas. The atlas is geometrically represented as a sphere in the 3D space. Being metameric to one of the elements of the atlas, each spectral reflectance maps to the corresponding point in the sphere. While the atlas itself is independent of cone photopigments, the position of its image in the sphere does depend on spectral positioning of photopigments (referred to as individual colour stimulus shift). (A particular case of such dependence is observer-metamerism.) This happens because for different observers a spectral reflectance is metameric to different elements of the atlas. Such an individual colour stimulus shift, measured in terms of spherical metrics, was evaluated for 1600 Munsell papers by varying peak sensitivity wavelength of the S, M, and L photopigments over the broad range of spectrum. The individual colour stimulus shift averaged over all the papers was found to be smaller than the difference between adjacent pages in the Munsell book measured in the same spherical metrics. It follows that the individual differences in colour appearance between trichromatic observers caused by variations in spectral positioning of photopigment peak sensitivity are practically insignificant.

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