Metamerism beyond colour vision
Françoise Viénot
Centre de recherche sur la conservation des collections, Muséum national d’histoire naturelle, Paris, France, vienot@mnhn.fr

Metamerism is fundamental to colour science. The generic framework of metamerism implies that the number of sensors is smaller than the dimension of the stimulus. This lecture deals with some previous studies in which the generic framework of metamerism has been exploited.

In the simulation of dichromatic colour vision, which has been produced from the three dimension colour gamut of a video display, it has been accepted that confused colours reduce to a single colour so as to produce a reduced image in a two dimensional colour space.

Metamerism can be extended beyond trichromacy. Metamers are only defined with respect to cone excitation whereas they may excite differently other visual pigments. Following the recent discovery of the melanopsin photopigment, the visual response is no longer three-dimensional. It is four or five dimensional, when rods and melanopsin cells are responsive. Multispectral light sources facilitate emergence of metameric illuminations. The higher the number of spectral bands, the wider the choice of metameric lights. According to Wyszecki, any stimulus can be considered as resulting from two components, the fundamental metamer and a metameric black. Thus, the contribution of the fundamental metamer can be isolated from the effect of additional metameric blacks. On the one hand, there exists only one fundamental metamer that corresponds to a given colorimetric specification. So, the fundamental metamer stimulus is trivariant. On the other hand, metamers can be designed to favour or to counteract a specific effect. The metameric black framework has been applied to isolating the melanopsin response. It could as well be applied to isolating other types of sensitive pigments.

Manipulating metamerism of multi-spectral illumination modifies the colour rendering of the illumination. Some spectral power distributions result in colourfulness enhancement. We question whether such manipulations could be informative about anomalous trichromatic colour perception.