

CAN CONE FUNDAMENTALS BE USED IN EVERYDAY PHOTOMETRY?

Bergen, A.S.J.¹

¹ Photometric Solutions International, Melbourne, Australia
tonyb@photometricsolutions.com

Abstract

Since its beginning, colorimetry and photometry were directly related through the CIE colour-matching function $\bar{y}(\lambda)$ of the CIE 1931 standard colorimetric system which was set to be identical with the spectral luminous efficiency function for photopic vision, $V(\lambda)$. It is also well known that $V(\lambda)$ is not a perfect match to human vision and in particular it underestimates the visual response in the blue region. The physiology-based function, known as the cone-fundamental-based spectral luminous efficiency function, $V_F(\lambda)$, is defined in CIE publication CIE 170-2:2015, and again relates photometry to modern (i.e. cone-fundamental-based) colorimetry.

But switching to photometry based on cone fundamentals would have consequences including:

- The possible need to replace photometers with new devices that are either matched to the $V_F(\lambda)$ function instead of $V(\lambda)$, or which directly take spectrally resolved measurements and derive luminous quantities through software integration.
- The possible need for the definition of a new defining constant $K_{cd,F}$ for cone-fundamental-based photometry, the intention of which is to reduce the impacts of a change in photometrical scales.
- The replacement or supplementation of the existing colour-matching functions used in colorimetry with new functions based on cone fundamentals, including the possible need to replace tristimulus colorimeters with new devices that are matched to the new functions instead of the existing colour-matching functions and to update software or firmware for instruments which directly take spectrally resolved measurements and derive colorimetric quantities through software integration.
- The corresponding effects on scotopic photometry (including the quantity “S/P ratio” used to characterise sources) and mesopic photometry.

This workshop will feature three short presentations to introduce the topic, followed by a panel discussion with interaction from the audience to explore the implications of moving towards cone-fundamental-based photometry. The introductory presentations will be as follows:

1. Dr Lorne Whitehead (CA) – Introduction to cone fundamentals and the $V_F(\lambda)$ function;
2. Yoshi Ohno (US) – Viewpoint from CCPR and traceability;
3. Peter Blattner (CH) – Ideas for practical implementation of cone fundamental-based photometry.