*Color Rendering:* *A Calculation That Estimates Colorimetric Shifts,*

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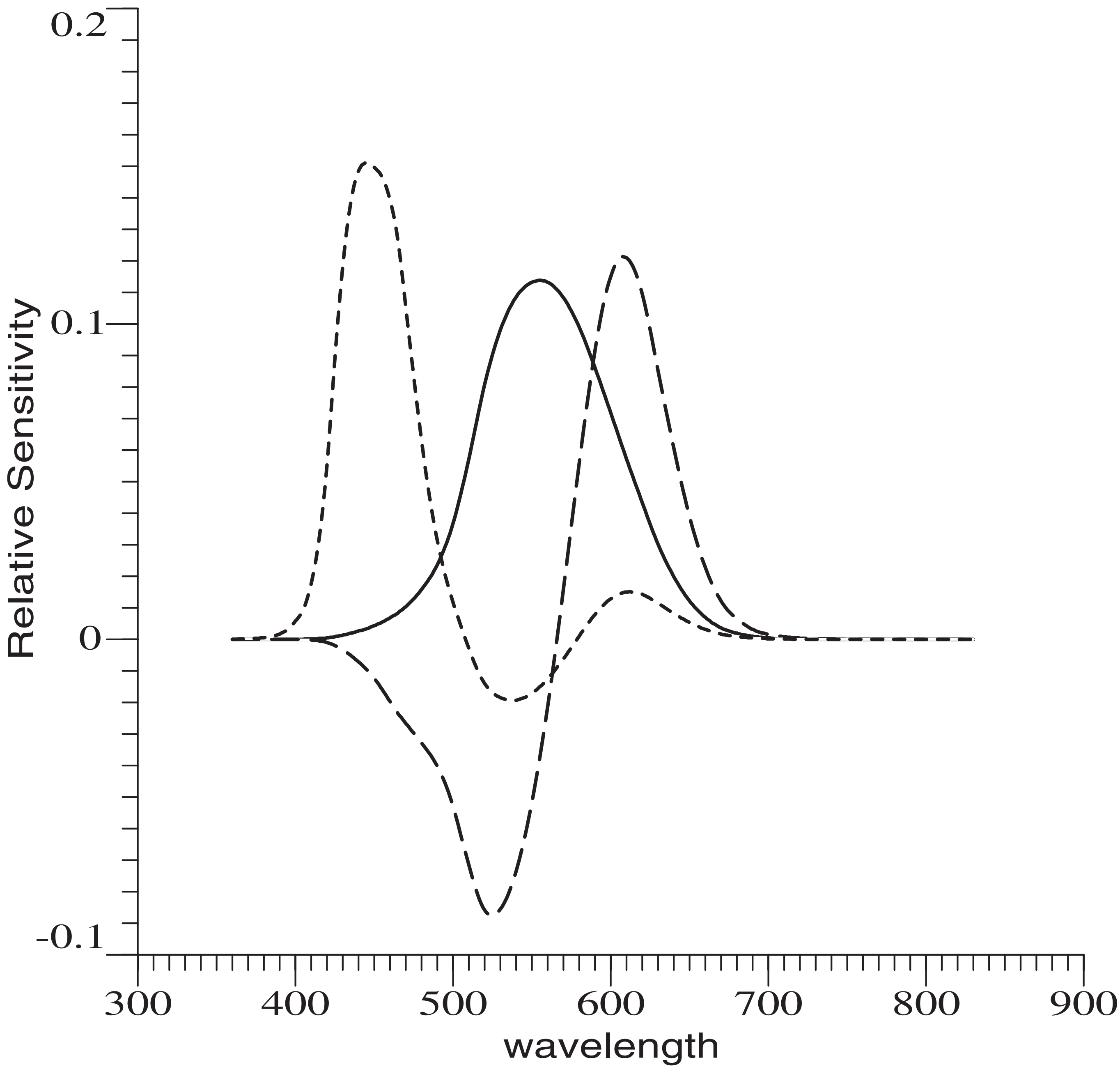


**Figure 1.** Set of orthonormalized opponent color functions. As color matching functions, these are equivalent to the usual CIE 2˚ observer. Solid = achromatic sensitivity $\overline{q_1}(\lambda)$, proportional to the familiar $\overline{y}(\lambda)$. Long dashes = $\overline{q_2}(\lambda)$ = red-green sensitivity. Short dashes = $\overline{q_3}(\lambda)$ = blue-yellow sensitivity.

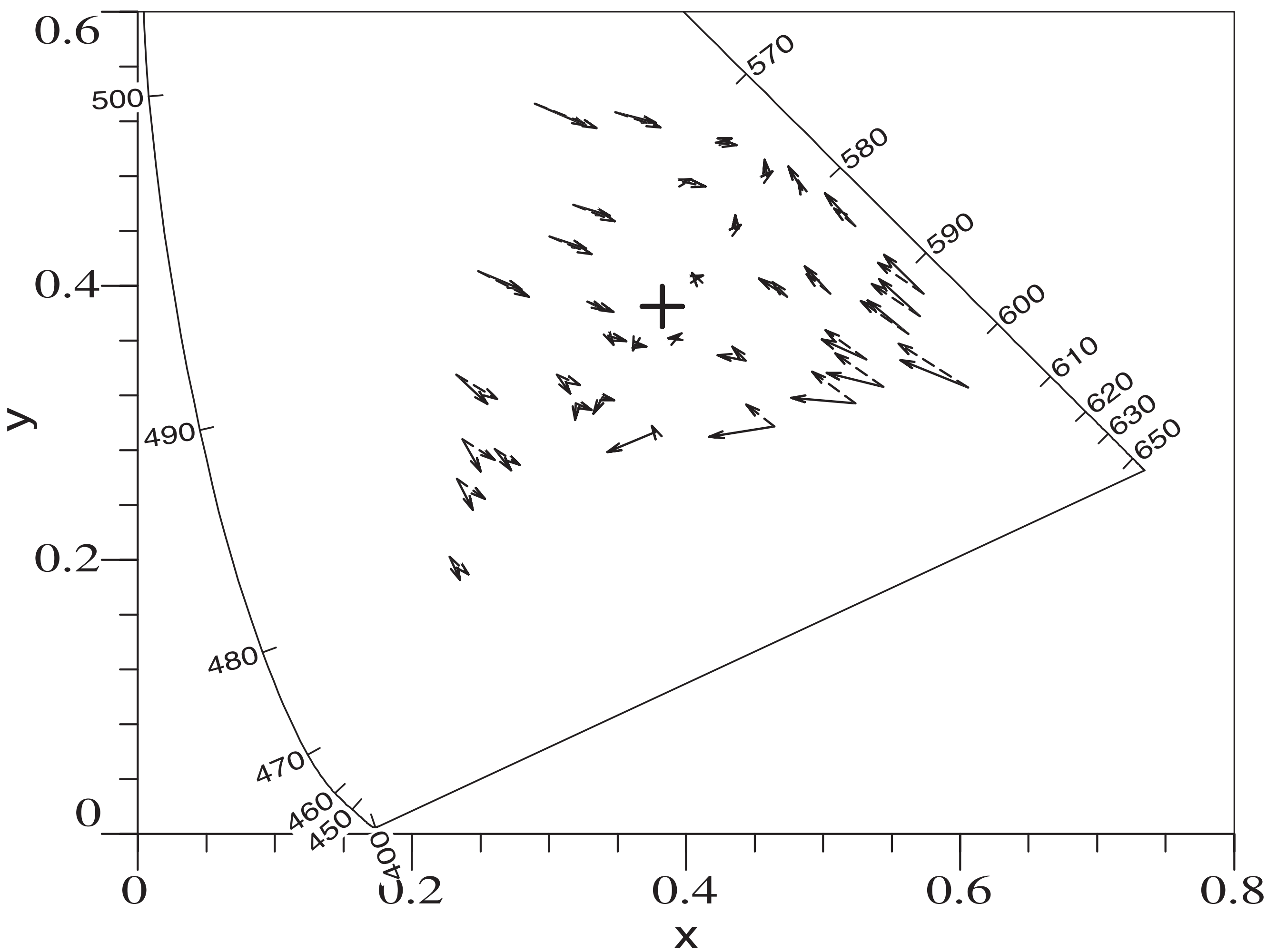


**Figure 2.** Chromaticity shifts of 36 Munsell papers are graphed. Arrow tails show the chromaticities under JMW daylight, while arrow heads represent chromaticities under Cool White fluorescent light. Both lights have the same chromaticity, (0.3825, 0.3850), indicated by +. Solid arrows are computed exactly, while the dashed arrows are estimated according to Eq. (13).

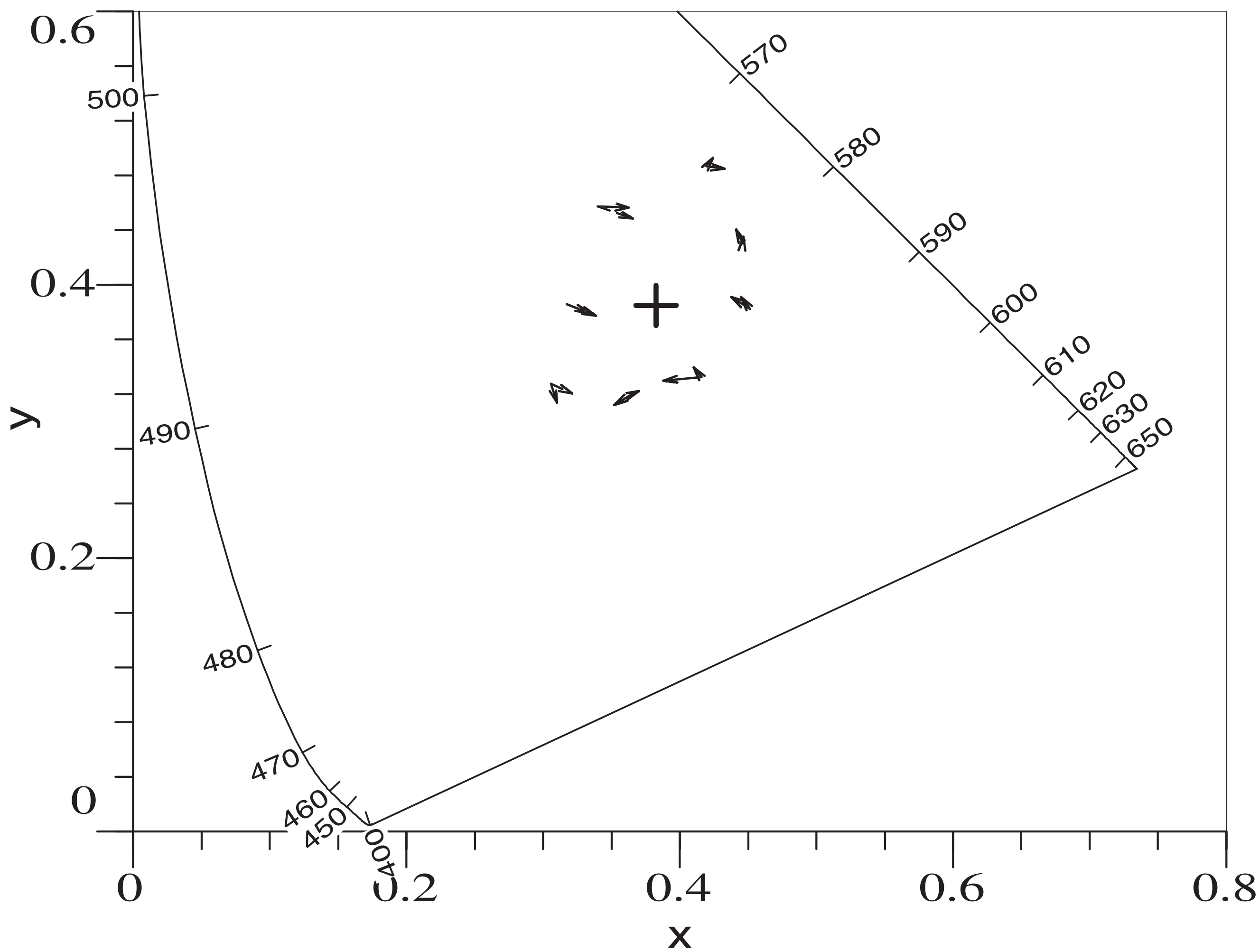


**Figure 3.** The lighting transition is the same as in Fig. 2, from JMW daylight to Cool White fluorescent of the same chromaticity, (0.3825, 0.3850), indicated by +. Now only 8 Munsell papers are represented, the ones used in the Color Rendering Index method. Again, the solid arrows show exact results, while the dashed arrows are estimated using Eq. (13).

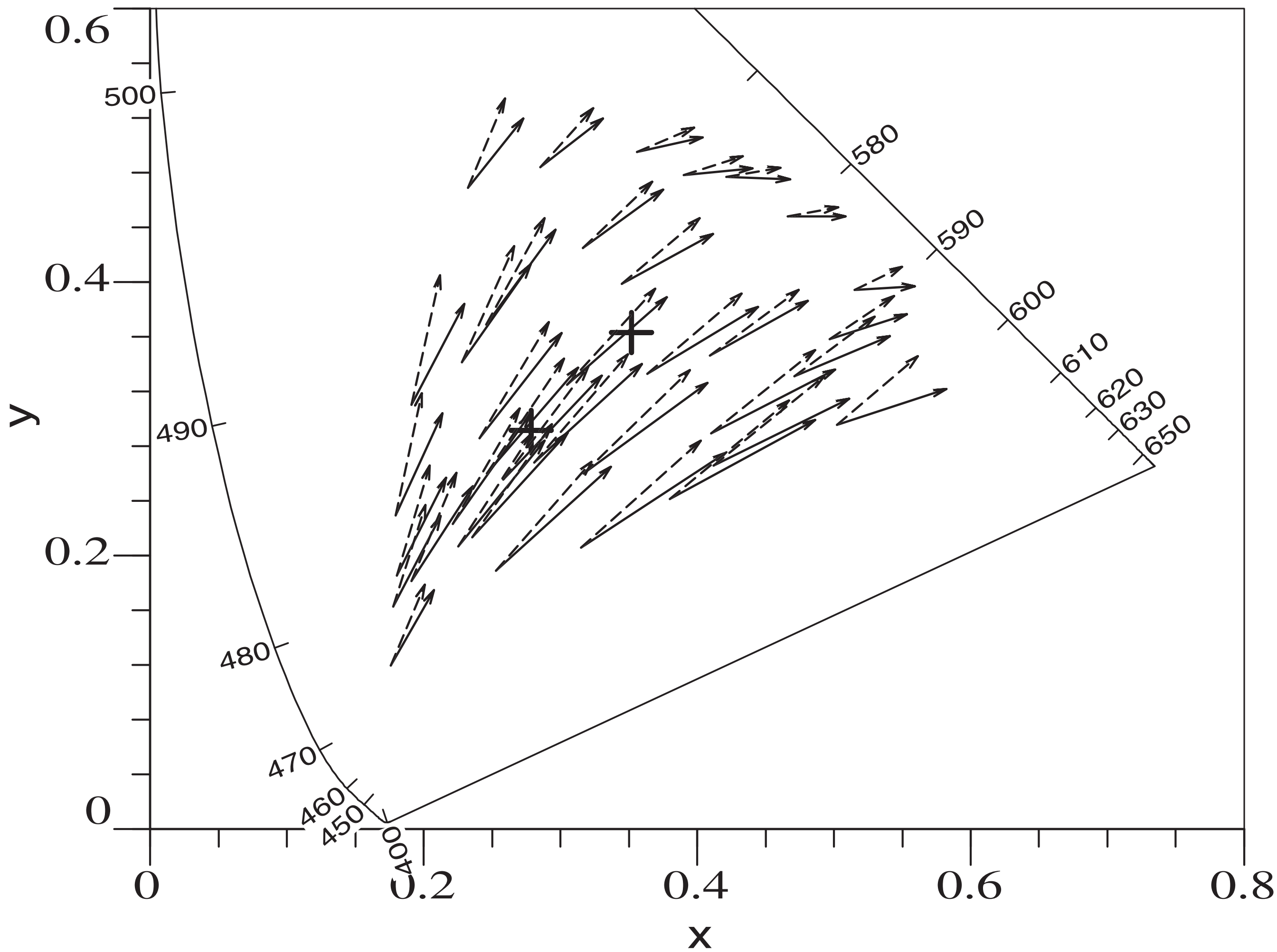


**Figure 4.** Again the 36 Munsell papers are seen, but the transition is from JMW daylight at 10 000 K to JMW daylight at 4800 K. Solid and dashed arrows are used as before.

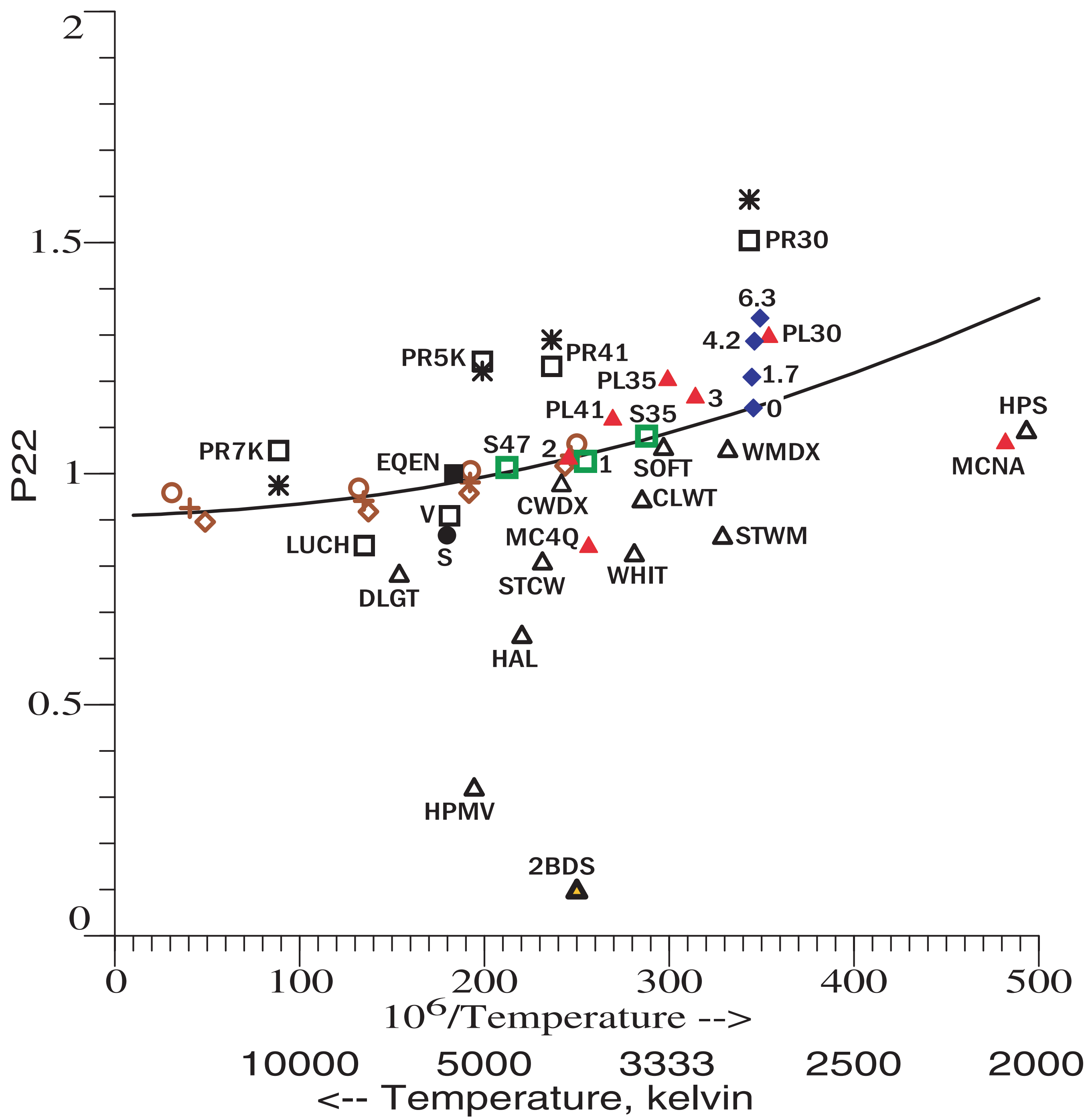


**Figure 5.** Matrix element $P_{22}$, the gain for red and green, is graphed versus correlated color temperature for various lights. The pivotal light is Equal Energy. See text for details.

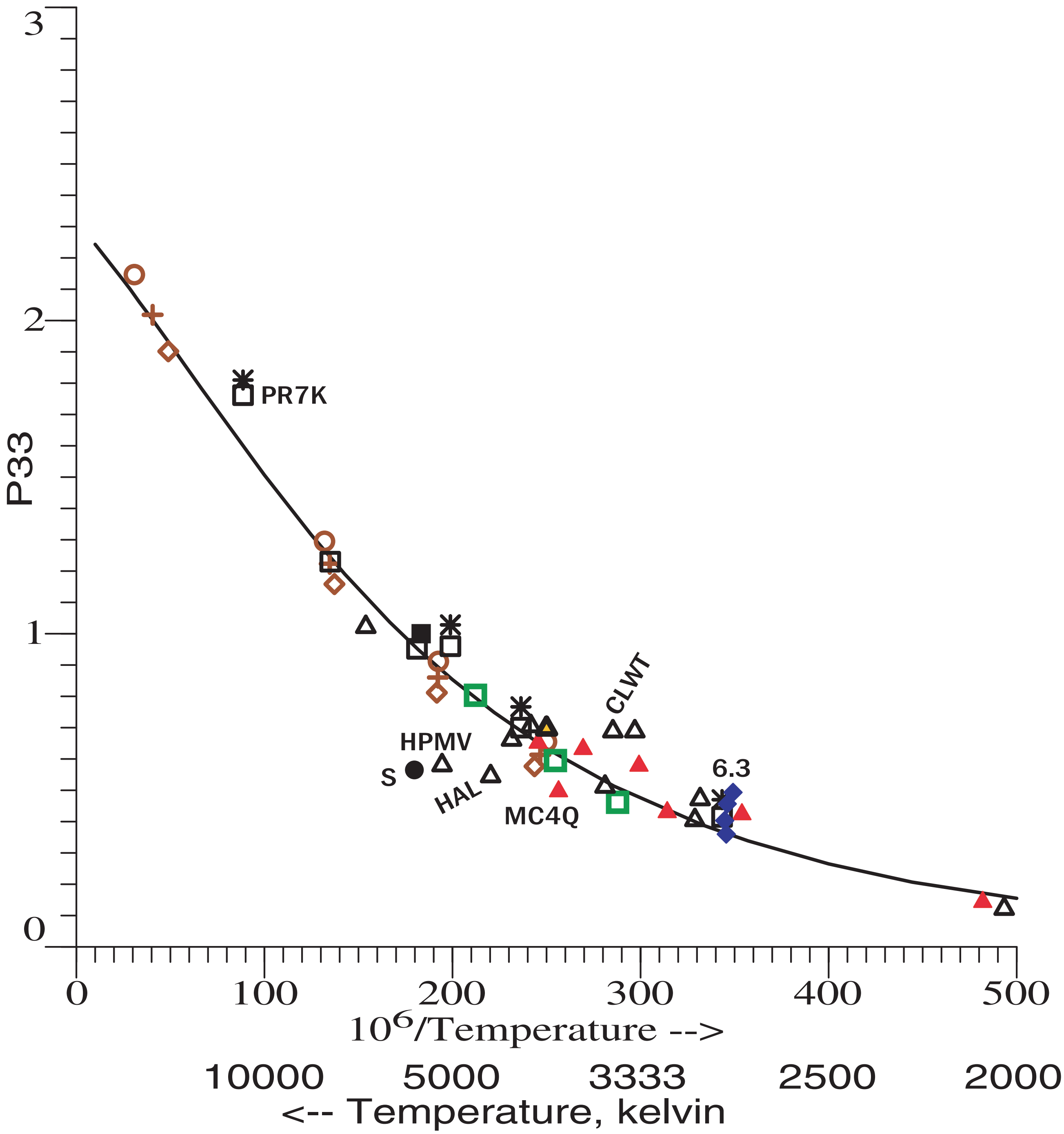


**Figure 6.** Similar to Fig. 5, but matrix element $P_{33}$, the gain for blue and yellow, is graphed. See text.

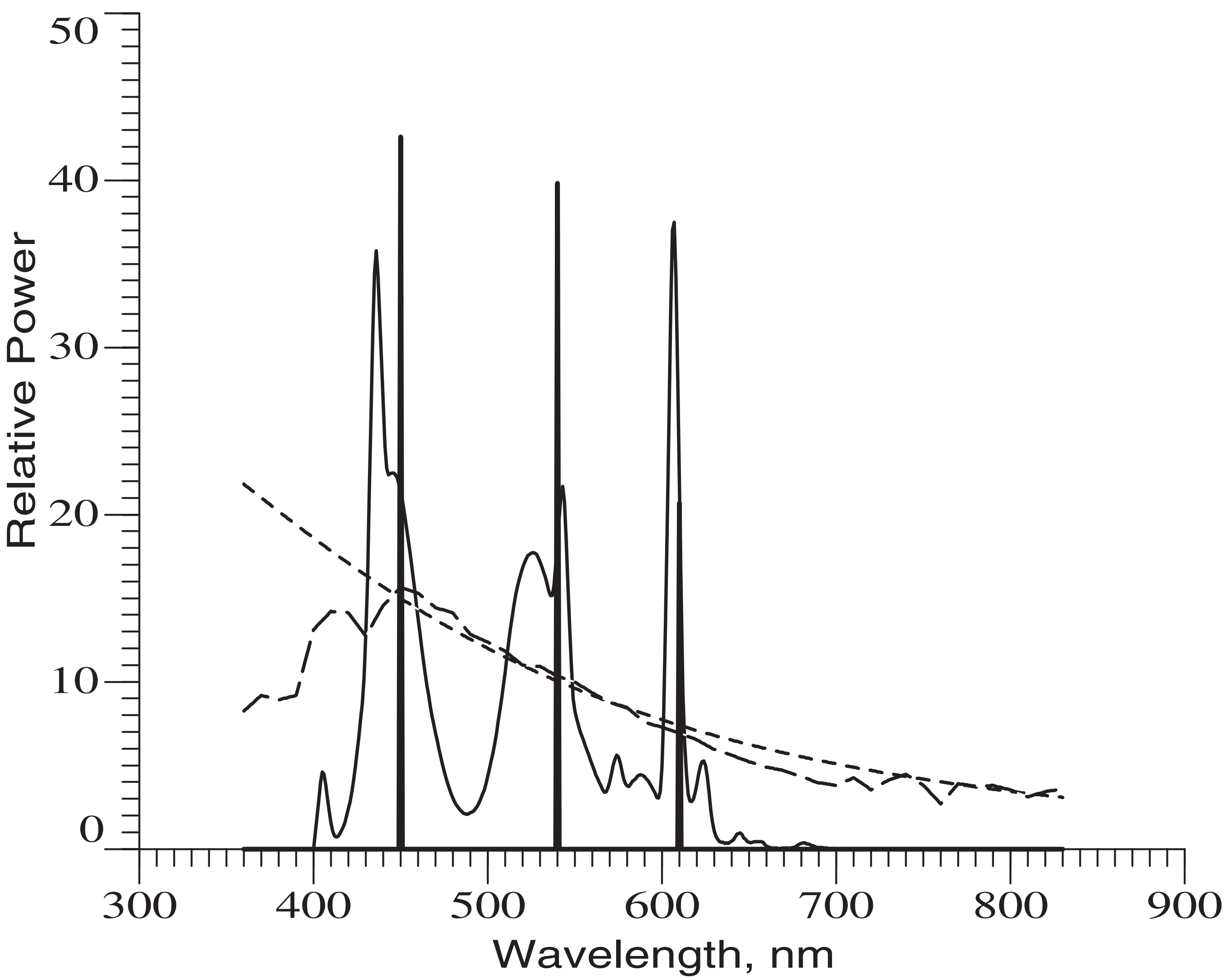


**Figure 7.** Comparison of idealized prime color to a prime color light that was once commercial, plus two other lights of similar chromaticity. The heavy solid line, seen as 3 narrow triangles, is the idealized prime color light, realistically graphed except that it is scaled by a factor of 0.05; (x,y) = (0.2695, 0.2892). The thin solid curve is the prime color fluorescent light, (0.2695, 0.2892); short dashes = 11,272 K blackbody, (0.2746, 0.2810); long dashes = JMW daylight, (0.2695, 0.2891).