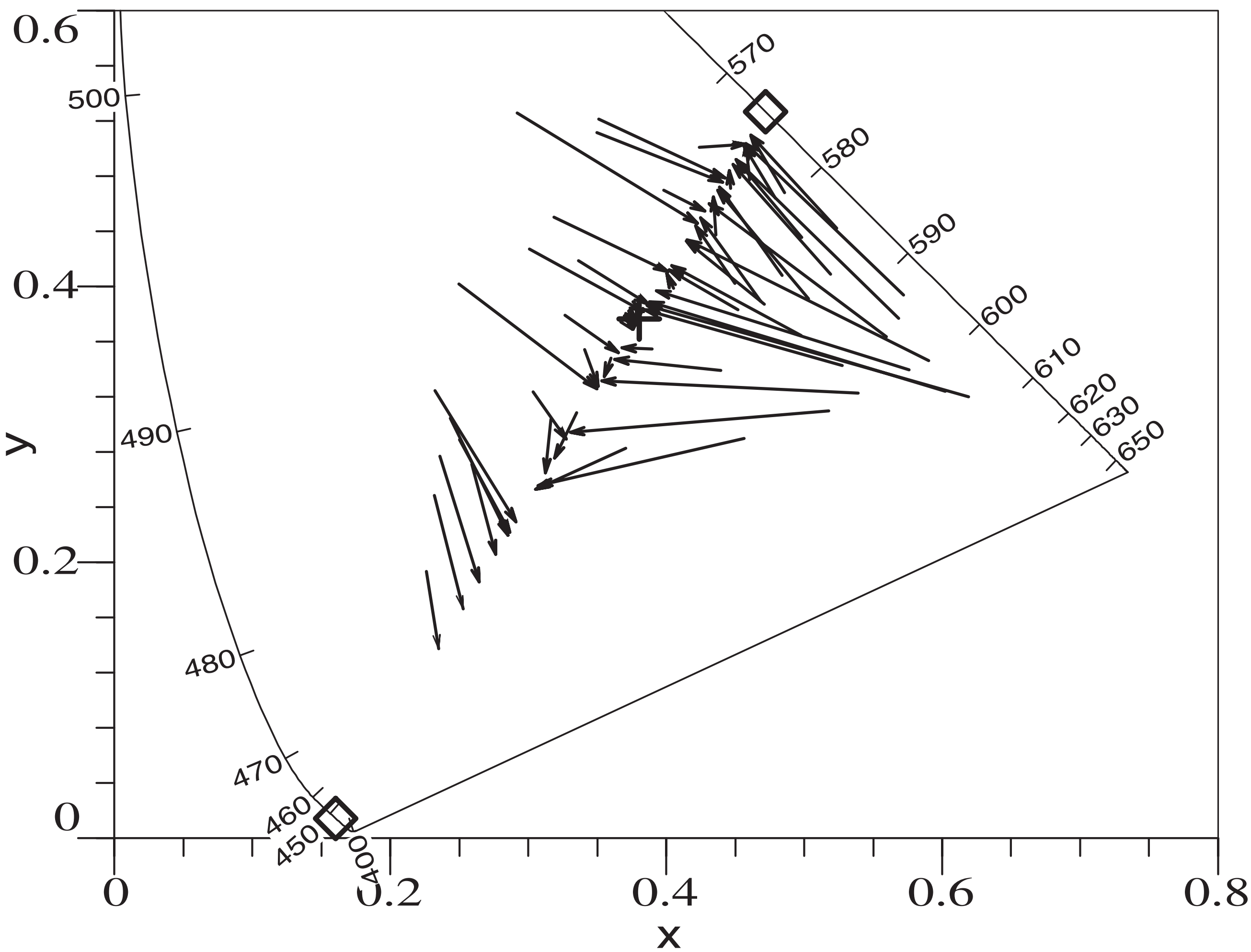

Figure 1. Loss of red-green contrast under 2-bands light. Initial light = L_1 = 4002 K blackbody radiation. Second light = L_2 = a 2-bands light, with its radiant power in narrow bands at 446 nm (25.2% of power) and 574 nm (74.8% of power), indicated by diamond shapes, ◇, on the spectrum locus. Both lights have chromaticity (x, y) = (0.3804, 0.3767), indicated by +. Each arrow corresponds to one of the 64 Munsell reflectances measured by Vrhel *et al*[14]. The arrow tail is the chromaticity of a Munsell paper under L_1, while the arrow head is the chromaticity of that paper under L_2.

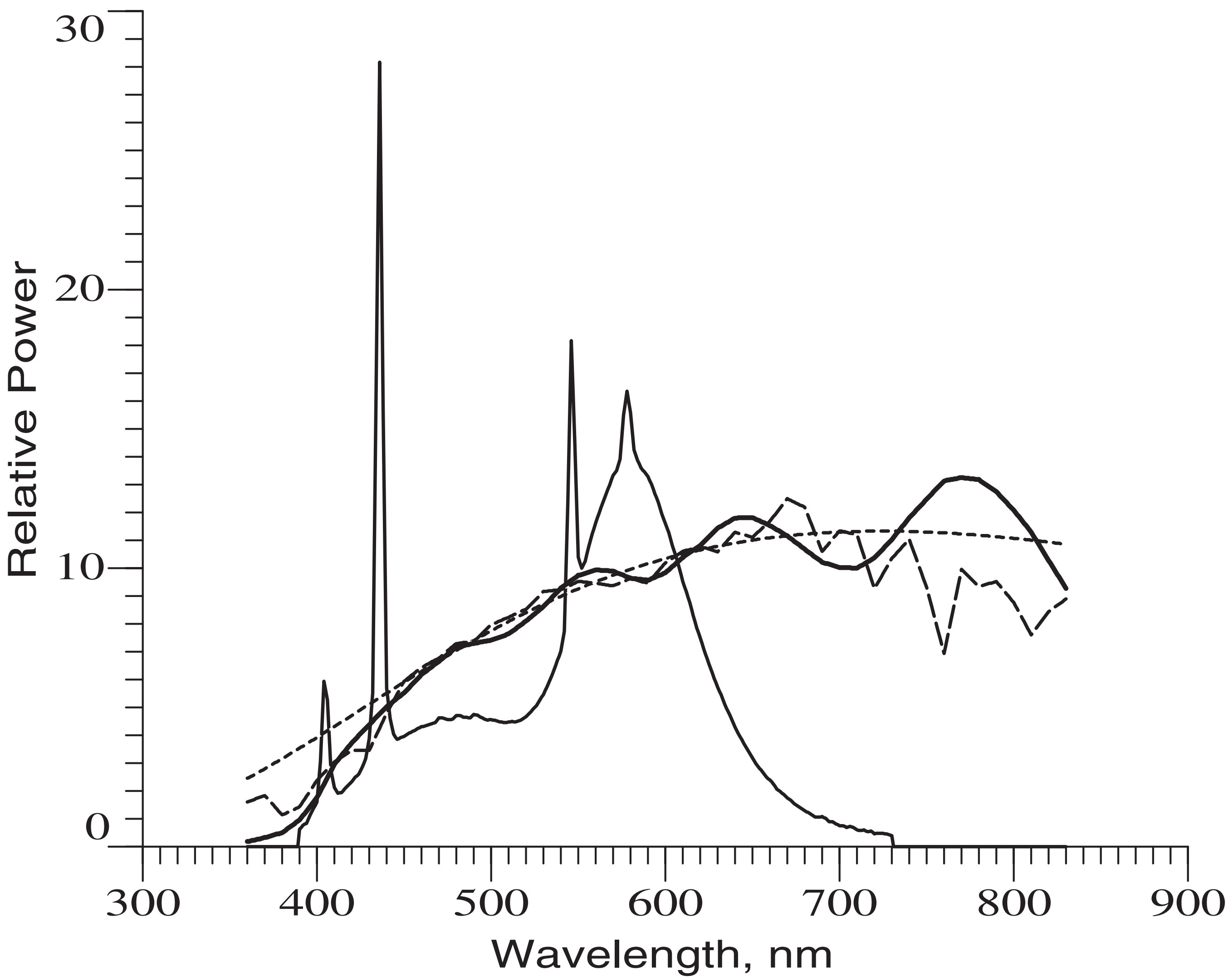

Figure 2. Spectra of 4 lights with equal luminance and approximately equal chromaticity. Thin solid line = cool white fluorescent, $(x, y) = (0.3825, 0.3850)$. Short dashes = 4002 K blackbody, (0.3804, 0.3767). Longer dashes = JMW Daylight, (0.3825, 0.3849). Thicker solid line shows a commercial filtered tungsten-halogen lamp, (0.3850, 0.3833).

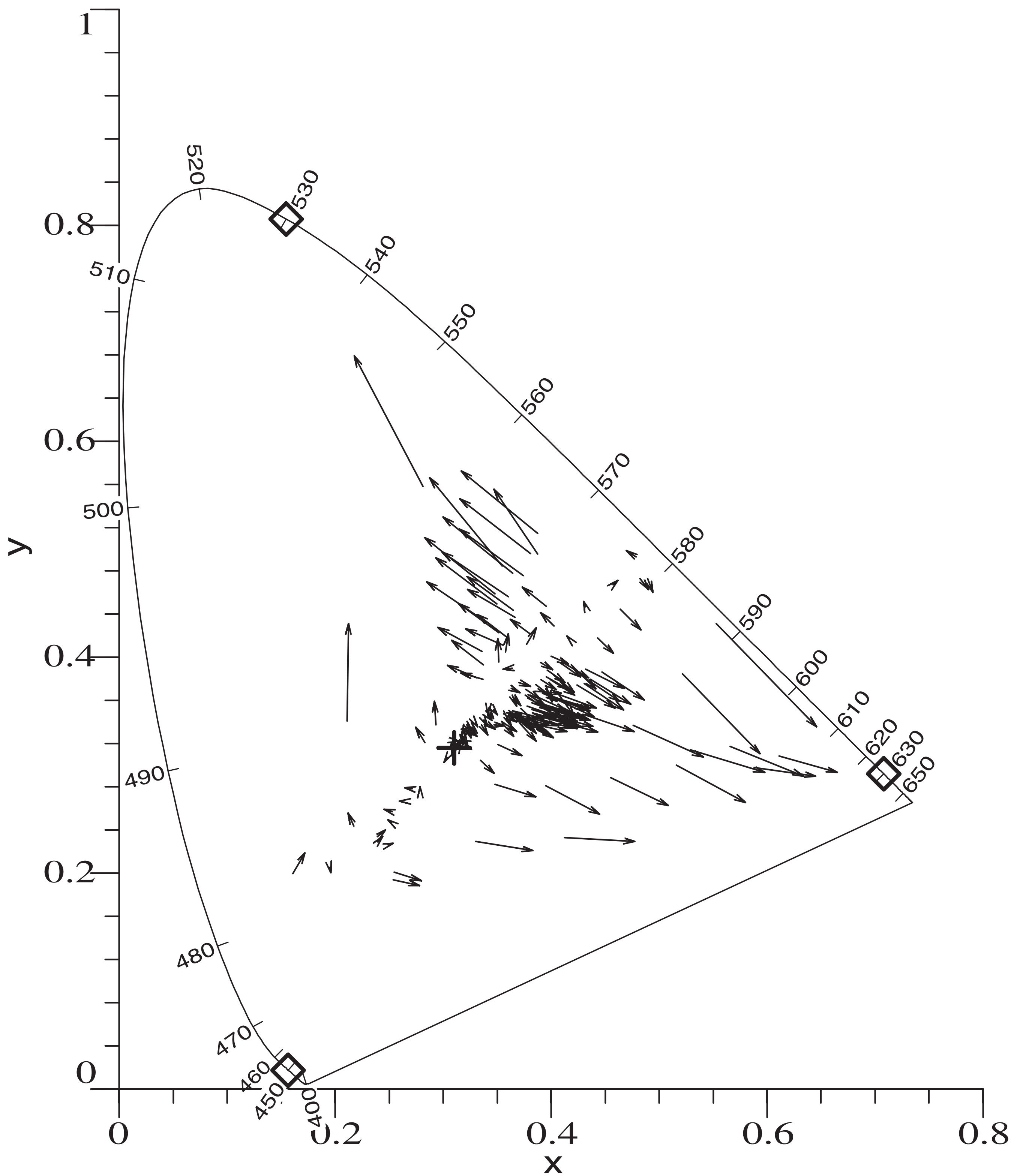

Figure 3. Light C → 3-bands light. As in Figure 1, each arrow shows the chromaticity shift of a Munsell paper. L_1 = Illuminant C. L_2 = a light of 3 narrow bands, using the 3 wavelengths from the quantitative retinex experiment, 450, 530, and 630 nm. Again the diamond shapes, ◇, locate the narrow bands along the spectrum locus. Both light sources have chromaticity (0.3101, 0.3162), marked by +.

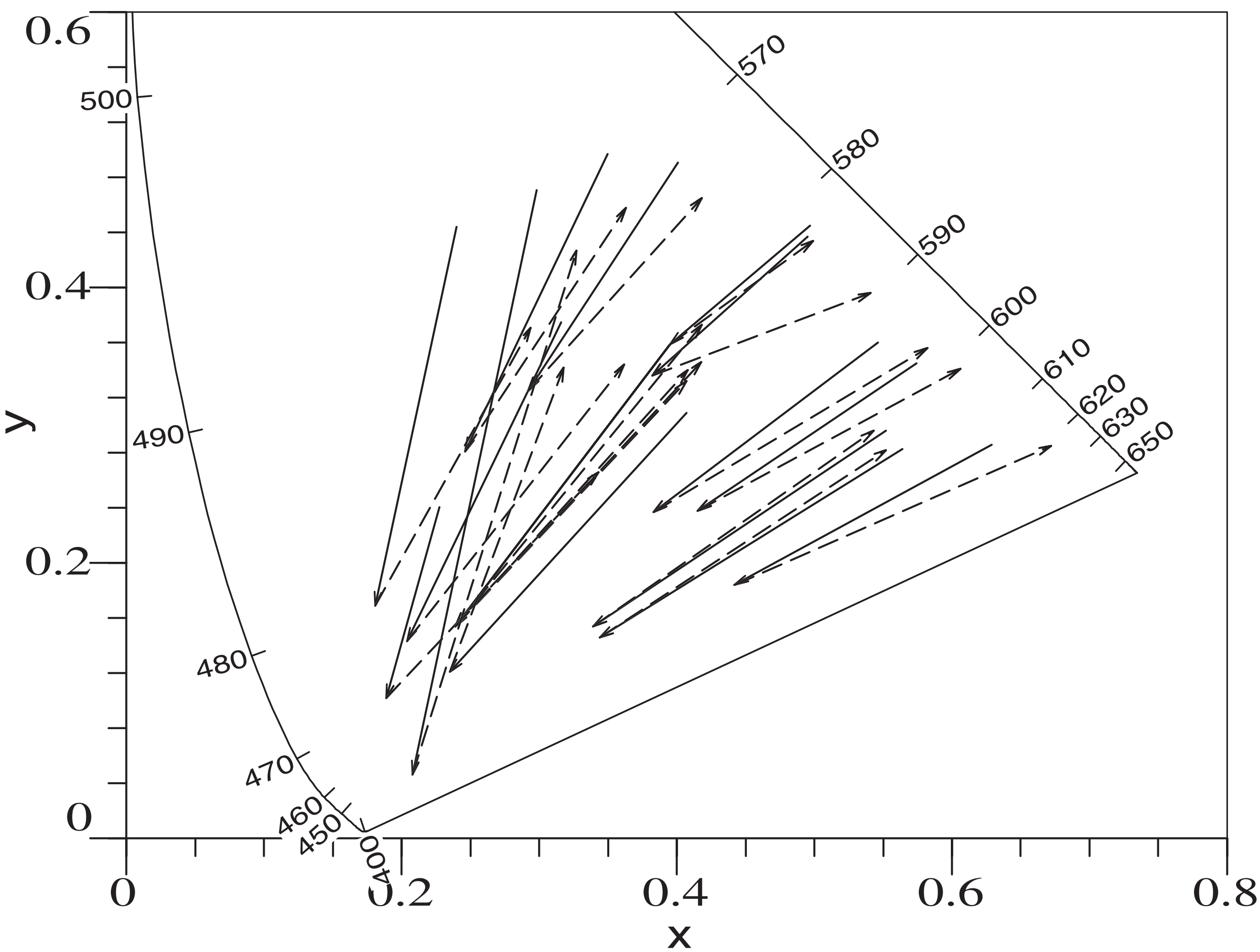

Figure 4. In the 2-dimensional chromaticity diagram, a subset of the data from the actual quantitative retinex experiment[12]. The tail of each solid arrow is the chromaticity of a paper under the light of the so-called "gray experiment." The head of that arrow is the chromaticity of that same paper under the light of the "yellow experiment" (a bluish light). A dotted arrow reaches from that point to a point representing, in effect, the *perceived* chromaticity of that paper reported by a subject.

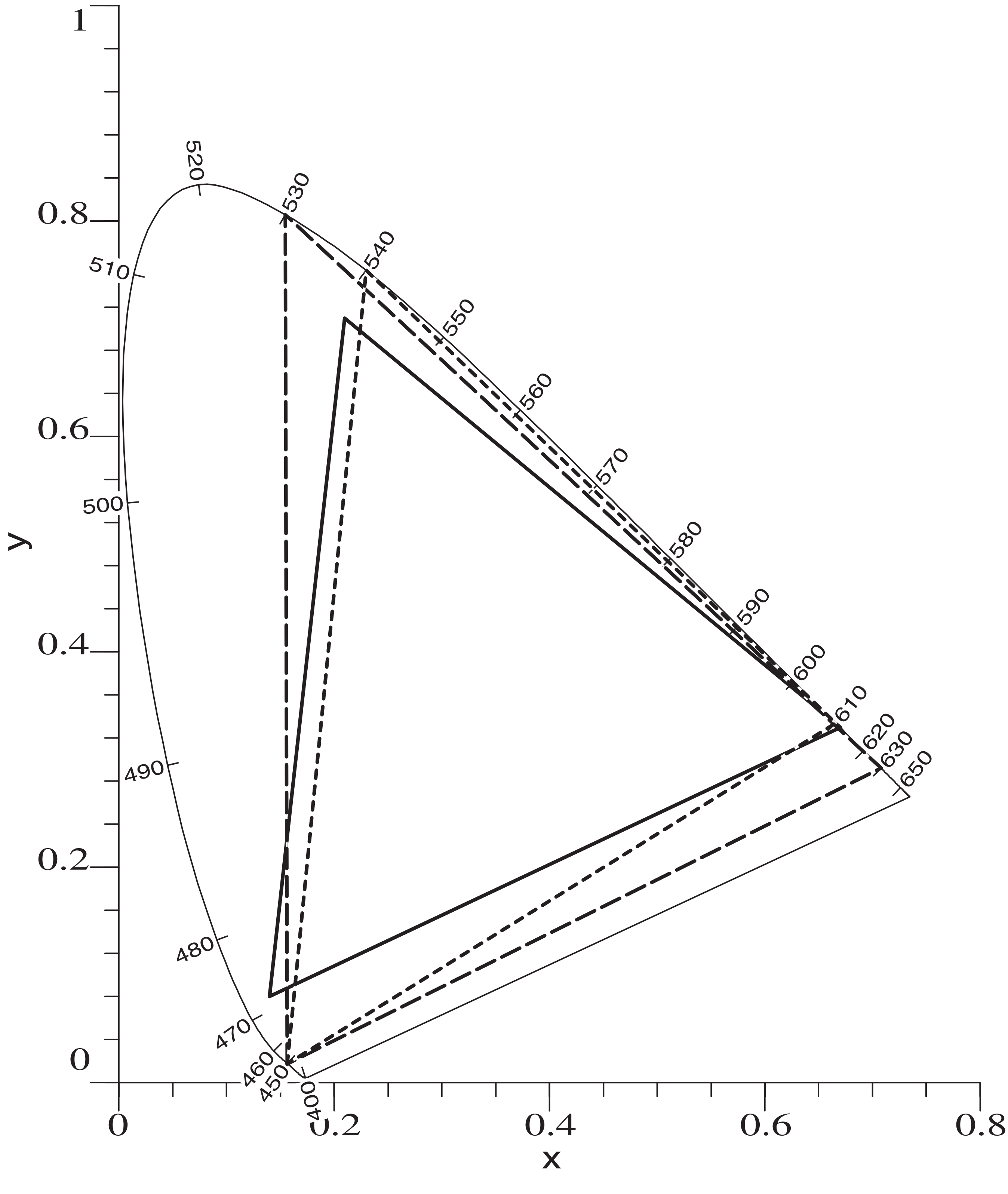

Figure 5. Triangles showing the 2-dimensional gamuts for mixtures of 3 primaries. The solid line corresponds to the NTSC video phosphors. The longer dashes are based on the 3 wavelengths from the quantitative retinex experiment[12], 450, 530, and 630 nm. The triangle of shorter dashes is based on Thornton's prime colors[19], 450, 540, 610 nm.

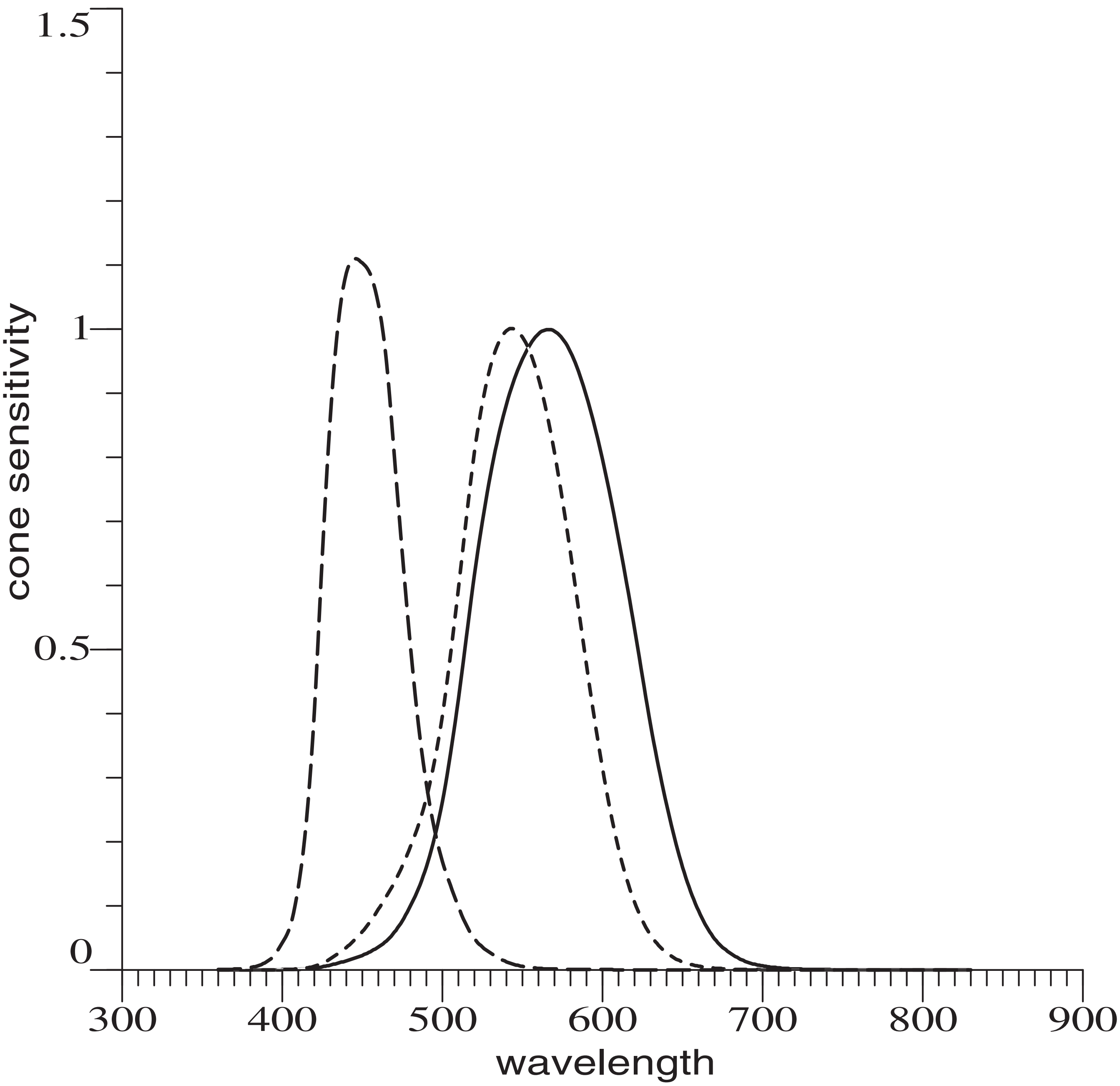

Figure 6. A version of human cone sensitivities, generated as linear combinations of the CIE 2° color matching functions. Solid = red-sensitive cones; short dashes = green-sensitive cones; long dashes = blue-sensitive cones.

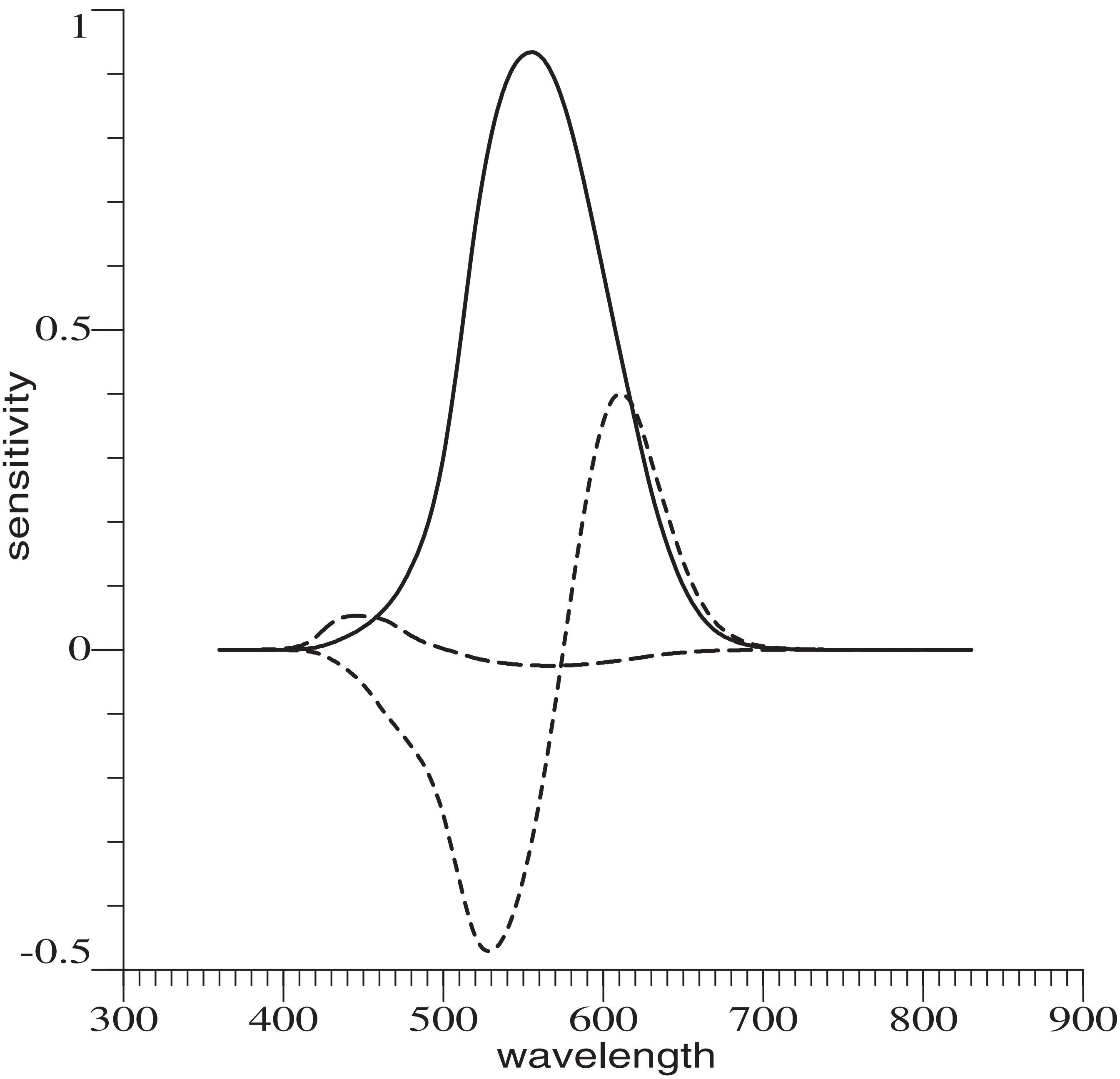

Figure 7. A set of opponent-color primaries, formed by linear combinations of the CIE 2˚ color matching functions. Solid line = $\overline{a}$ = the non-opponent function, proportional to $\overline{y}(\lambda)$ of the 2˚ observer. Short dashes = $\overline{t}$ = red-green opponent function. Longer dashes = $\overline{d}$ = blue-yellow opponent function.

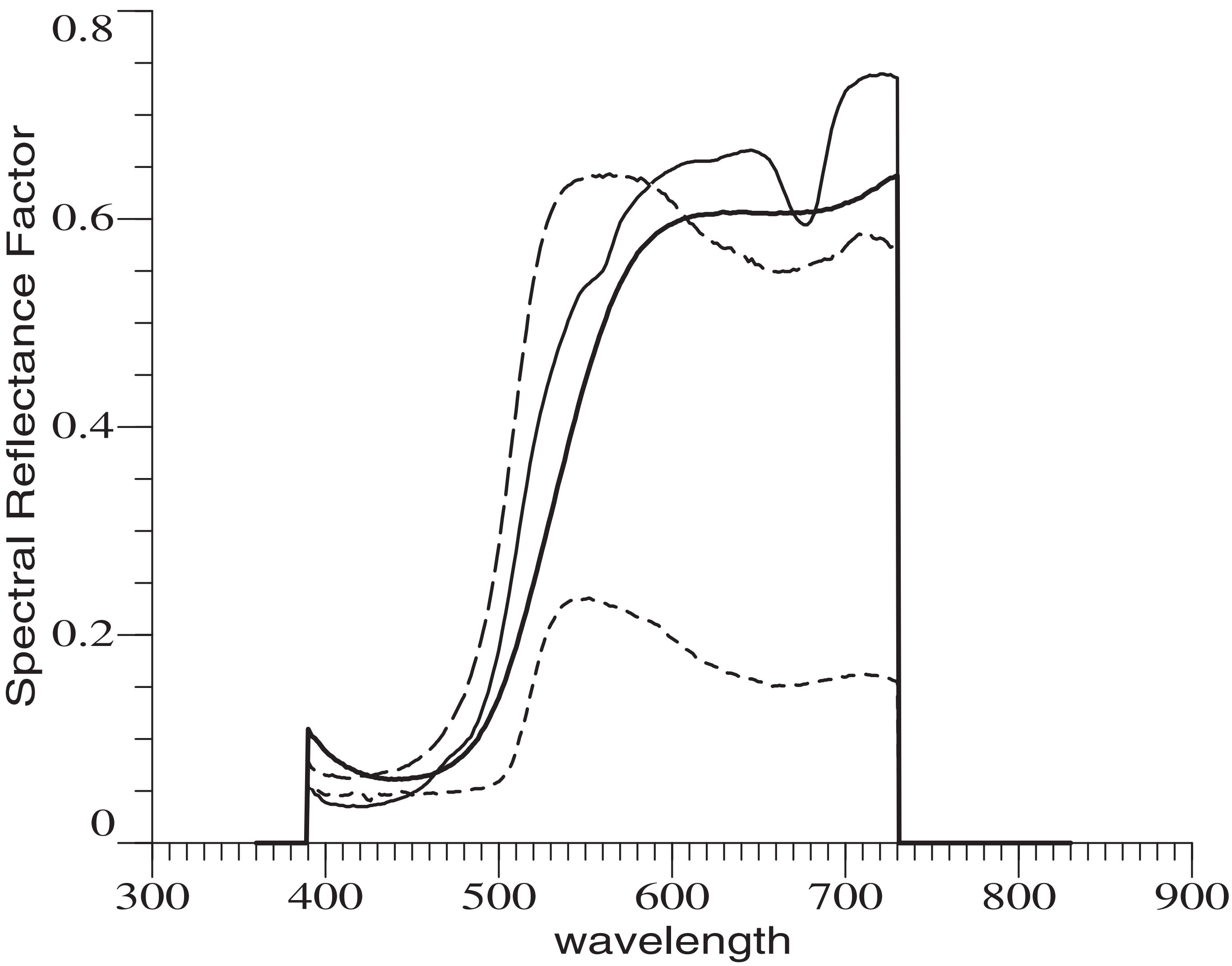

Figure 8. Reflectances of 4 yellow objects, from data of Vrhel *et al.*[14] Thin line = lemon skin. Shorter dashes = Munsell paper 10Y 5/6. Longer dashes = Munsell paper, 10Y 8/10. Thick line = yellow raincoat.

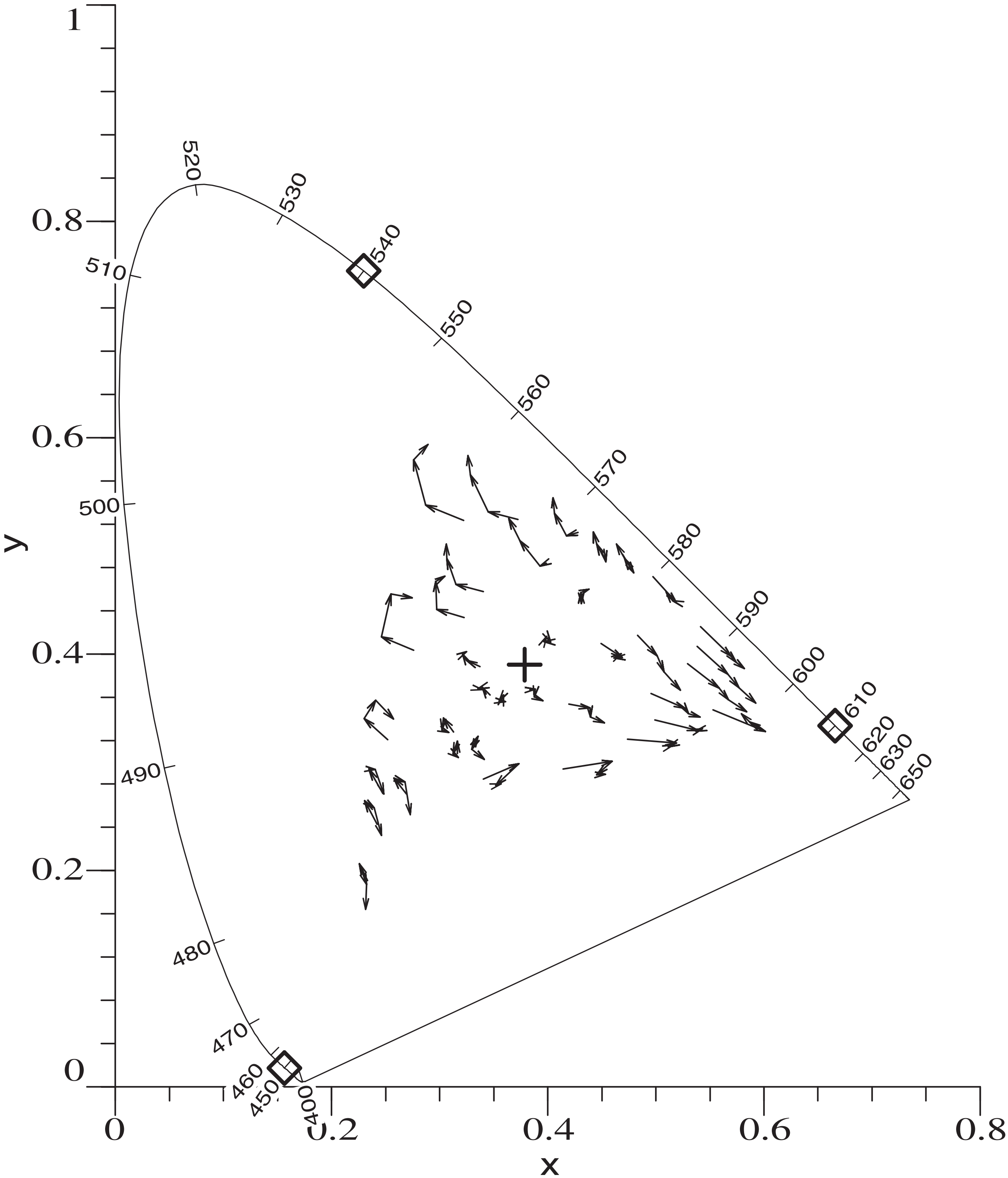

Figure 9. Four lights successively. Now only 36 Munsell papers are used, so that the arrows won't pile up. Each chain of arrows tracks the chromaticity of a paper under 4 lights in succession. L_1 = cool white fluorescent, $(x, y) = (0.3786, 0.3906)$. L_2 = JMW daylight, $(x, y) = (0.3787, 0.3905)$. L_3 = Commercial Prime Color light, nominal 4100 K color temperature, $(x, y) = (0.3749, 0.3890)$. L_4 = idealized Prime Color light comprising 3 narrow bands at 450, 540, and 610 nm; $(x, y) = (0.3786, 0.3906)$. The narrow bands are again indicated by diamond shapes, ◇.

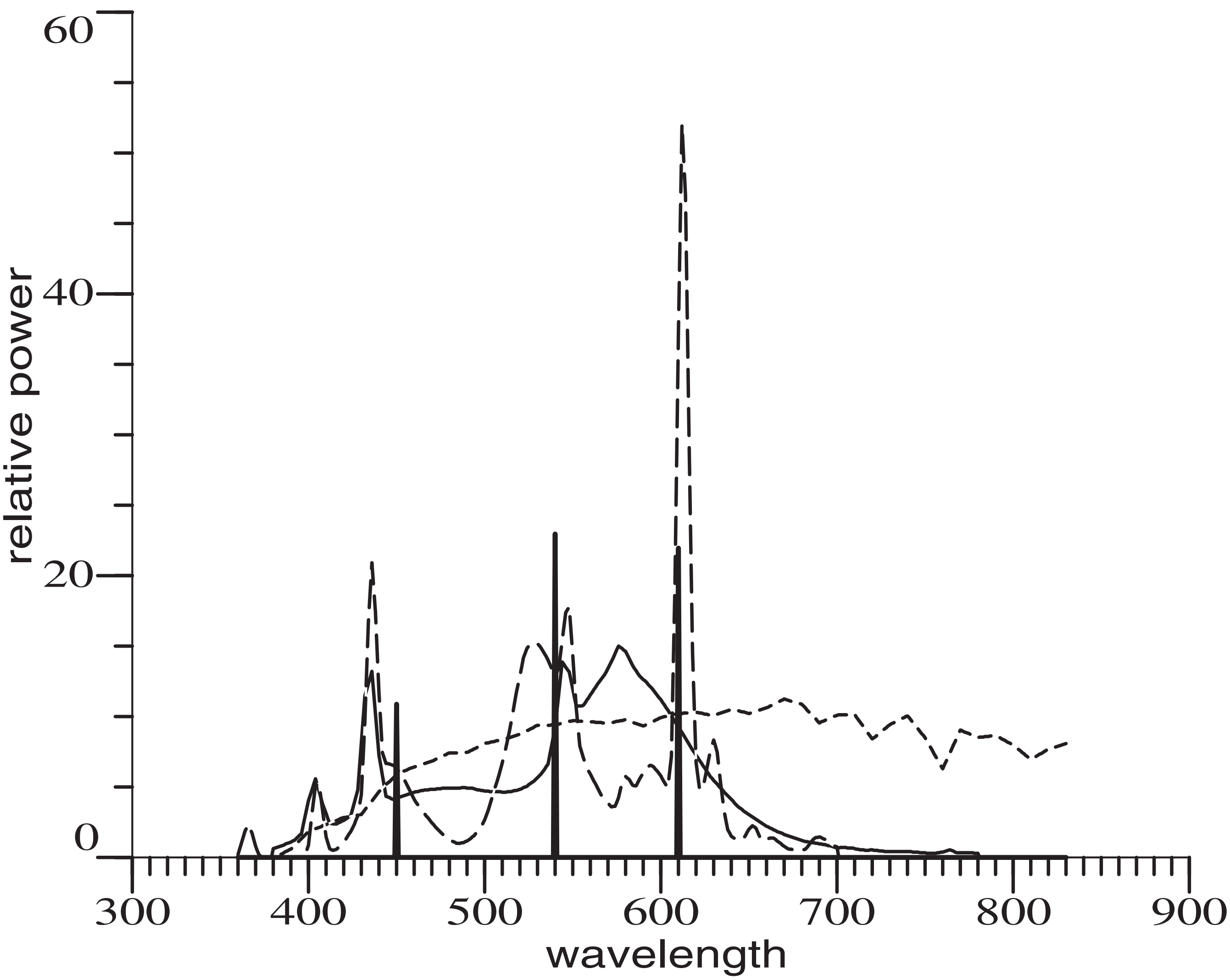

Figure 10. Spectral power distributions of the 4 lights used in Figure 9. Thin solid line = cool white fluorescent. Short dashes = JMW daylight. Longer dashes = commercial Prime Color light. Three narrow lines = idealized Prime Color. The lights are equated for illuminance, except that the 3 narrow lines have been scaled down by a factor of 30, in order to fit them on the graph.

Color Rendering: Asking the Question, James A. Worthey, 11 Rye Court, Gaithersburg, Maryland, 20878-1901, USA. **Figure 11 of 13 total figures.**

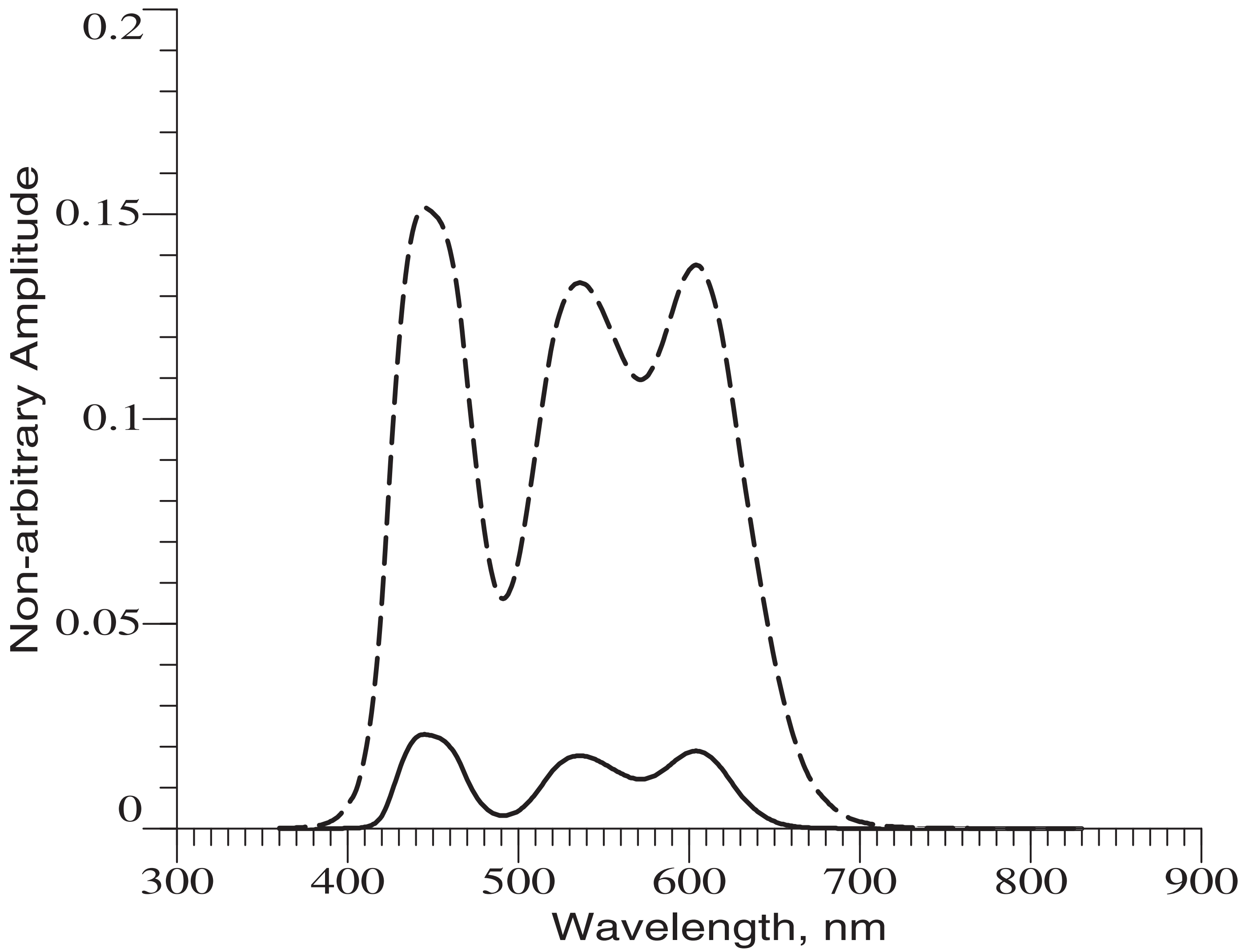

Figure 11. Diagonal of Matrix *R*, and its square root. The lower solid curve is the diagonal of Matrix *R*, and the upper dashed curve is the square root.

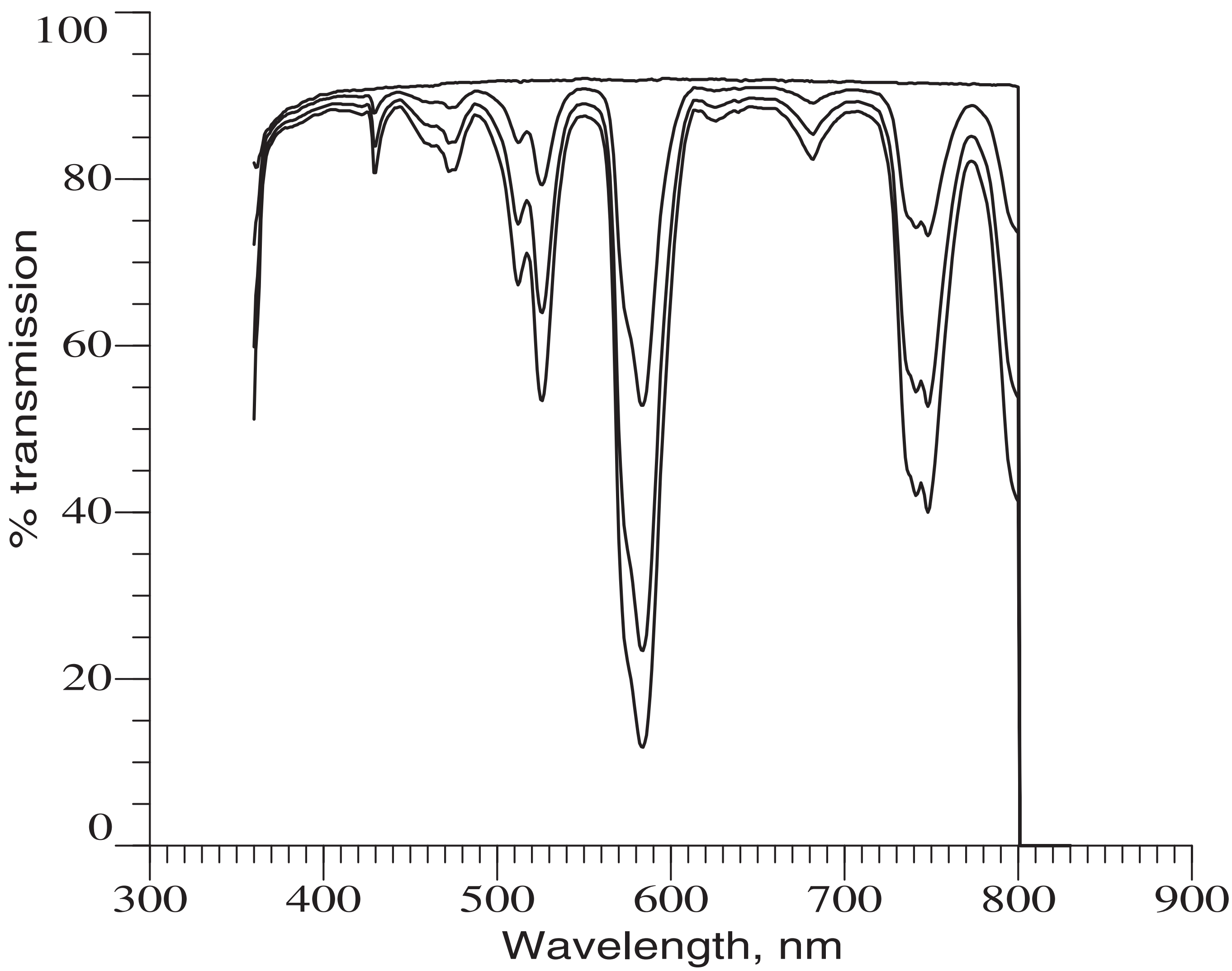

Figure 12. Spectral transmittance of neodymium glass, at 1.2 mm thickness, and successive concentrations of 0.0%, 1.7%, 4.2%, and 6.3% Nd_2O_3 . For the 2900 K light, the luminous transmittances are Y = 91.8%, 81.9%, 71.7%, and 65.7% .

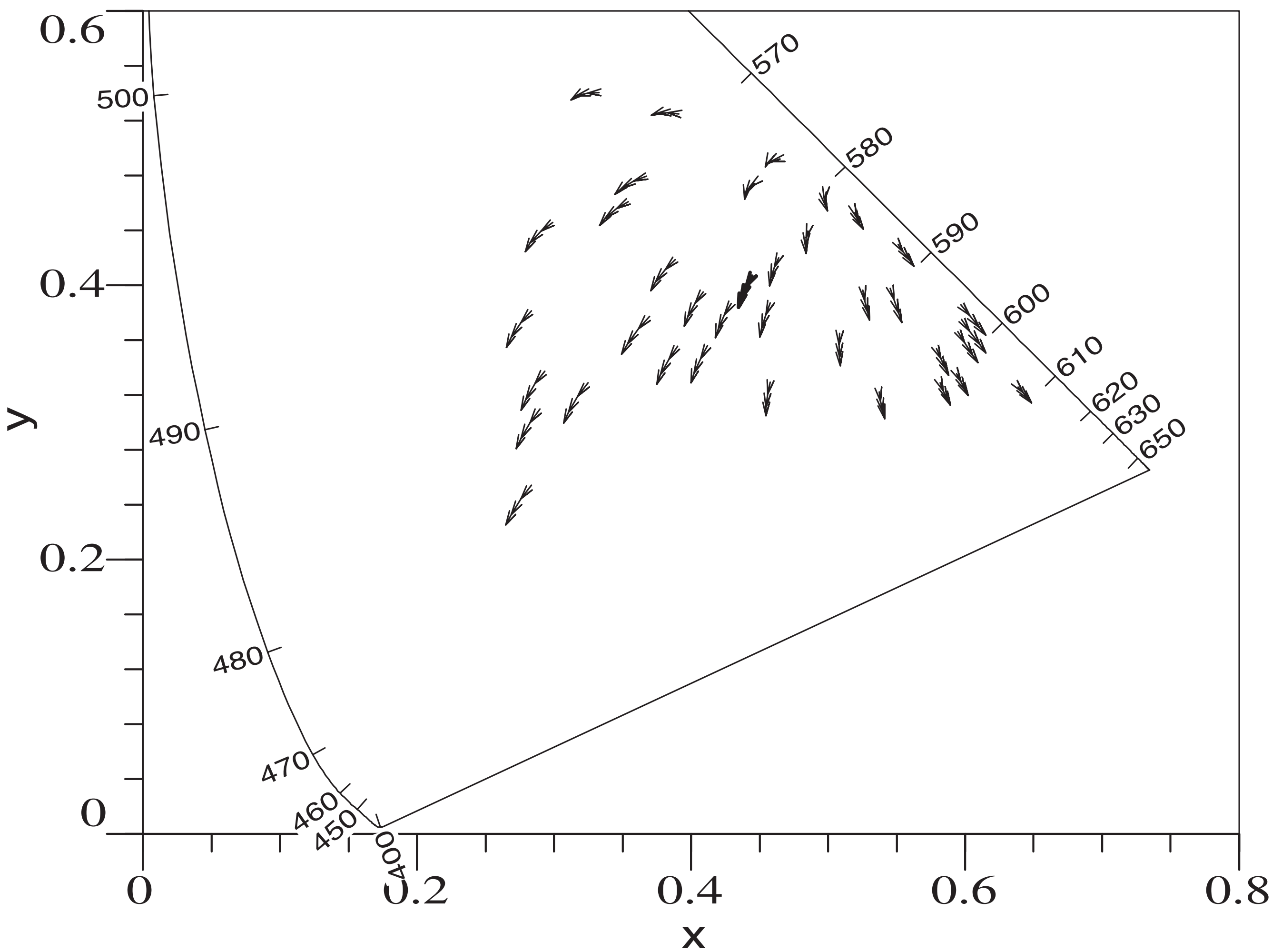

Figure 13. Chromaticity shifts with increasing concentration of Nd_2O_3 in a 1.2 mm glass layer over a 2900 K blackbody. The filter transmittances are as shown in the previous figure. The chain of slightly thicker arrows shows the shifting chromaticity of the light itself.