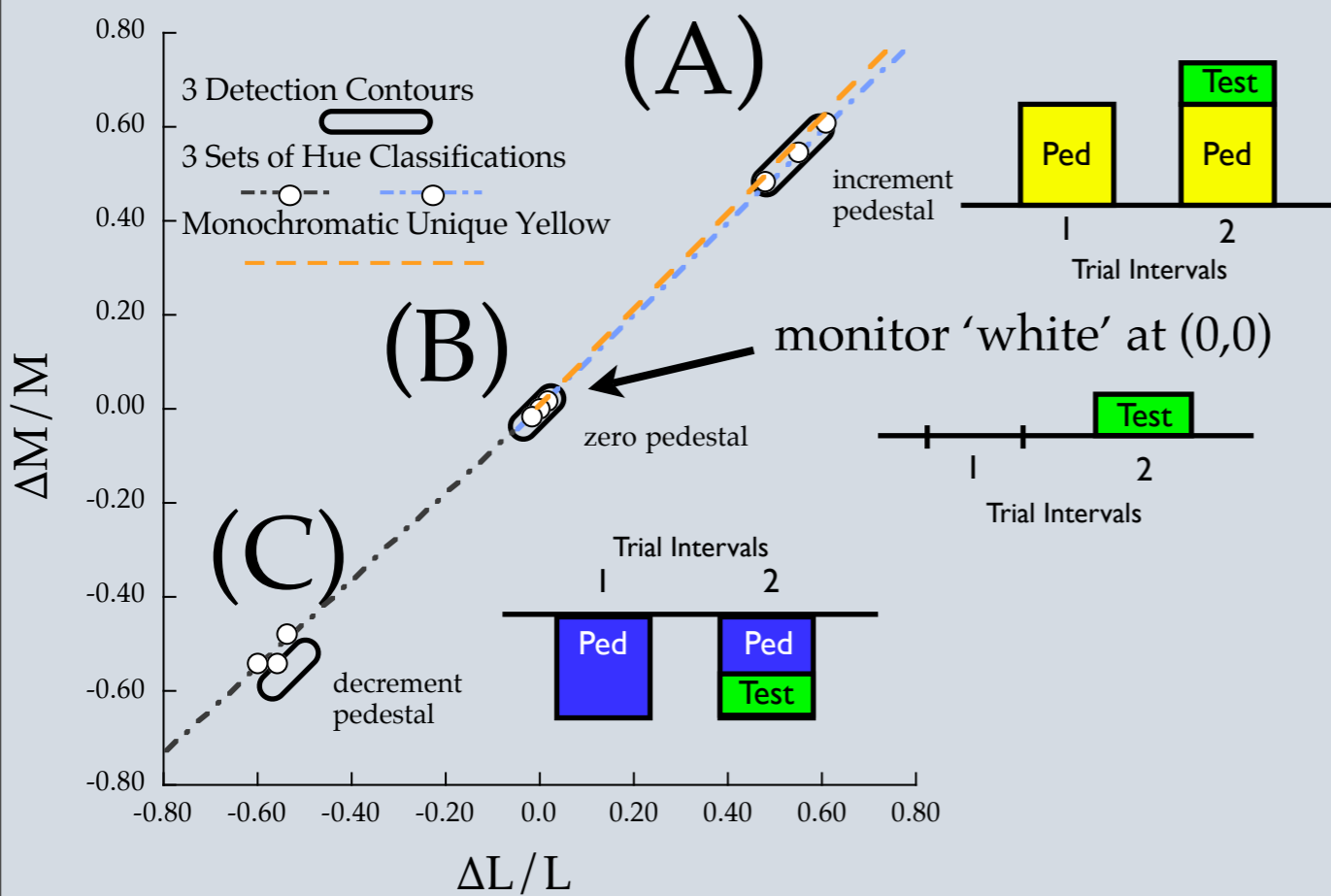


Red-Green Detection Contours and Hue Equilibria Redux

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The big picture:



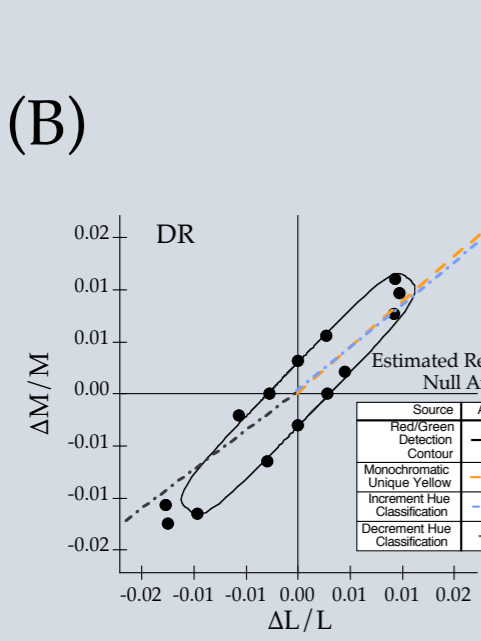
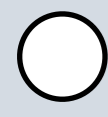
All data were collected in the $(\Delta L/L, \Delta M/M)$ plane -- S cones were never modulated.

Results from three procedures are compared:

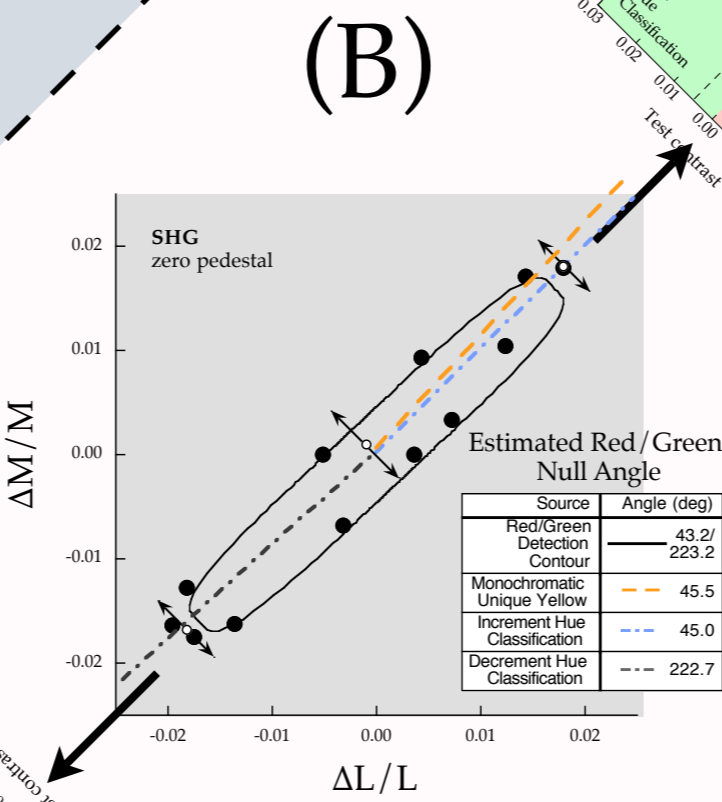
1. 2afc detection/discrimination. Pedestal in two trial intervals, test (of various color directions) added in one interval. Pedestals were equal increments or decrements in $\Delta L/L$ and $\Delta M/M$, presented at about 30X threshold.
2. Hue classification ("green" vs. "red") along the 135° direction in cone contrast space.
3. Monochromatic unique yellow settings (1.8° spot, 200 ms flashes against a 'white', Xenon arc background of 3.3 log Td)

Overview:

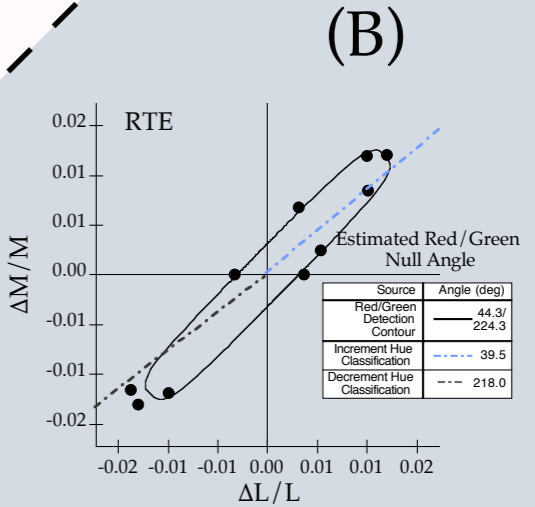
The mechanisms needed to explain color appearance are generally believed to have different characteristics from the mechanisms needed to explain chromatic detection (e.g., Mollon & Cavonius, 1987; Wuerger et al. 2005). However, in the case of the "Red" (R or $|L-M|$) and "Green" (G or $|M-L|$) detection mechanisms, the differences may be small, and may primarily involve a relatively small change in S cone input. Here we directly compare forced-choice detection/discrimination with hue classification in the $(\Delta L/L, \Delta M/M)$ plane of cone contrast space. Overall, the agreement between the stimuli classed as 'neither reddish nor greenish' and those not detected by R or G is remarkably good. Monochromatic unique yellows also agree. In detail, however, there are differences, especially for some observers, and especially for lights that are decrements relative to the adapting field.



The smooth contour is a fit of a standard threshold model, based upon probability summation of four independent mechanisms: R, G, luminance Increment, & Decrement.



Nulls (open circles) of the hue classifications align well with the center of the detection contour (better for SHG than two other observers). Moreover, the slope of the hue classification function implies a standard deviation that corresponds reasonably well with the R and G mechanism thresholds.

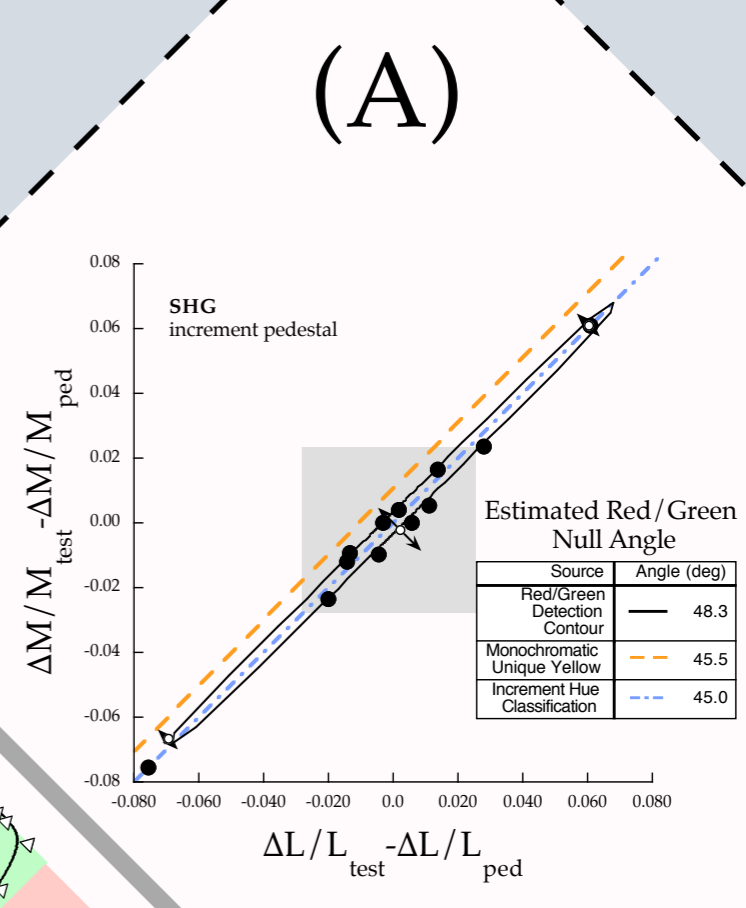


For observers DR and RTE, in the (B) zero pedestal condition, nulls of hue classifications lie along a line that is slightly flatter than the R/G detection contours. This is consistent with there being slightly less S cone input to detection than to hue.

However, this pattern is not seen in SHG; his hue classifications match the detection contour well in condition (B). For all observers, monochromatic unique yellow agrees reasonably well with the other measures, despite being collected on much brighter backgrounds.

Hue classification around the decrement pedestal, condition (C), is offset from the discrimination contour, suggesting (1) discriminations are made re the pedestal (locally) whereas hue judgments are made re the white background.

Whereas the 45° increment looks close to red/green neutral, the corresponding decrement is clearly reddish. This finding (which awaits confirmation in other observers) is consistent with prior results (e.g., the Helson-Judd effect). Slopes of hue classification functions correlate reasonably well with 2afc thresholds in all conditions and for all observers.



The pedestal facilitates R and G detection and masks luminance detection, narrowing and extending the detection contour