

Perceived illumination anchored by the highest luminance

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Perceived illumination anchored by the highest luminance.

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Abstract

Theorists like Helmholtz (1866/1924) and Katz (1935), proposed that perceived illumination within a field is based on the average luminance within the field. Recent experiments done through a vision tunnel, show evidence that perceived illumination is associated with the highest luminance, not average. Four experiments were run. Experiment 1: Observers looked through an aperture into a vision tunnel. Two windows were located at the far end of the vision tunnel. Each window opened into a chamber with variable illumination. The observer's task was to adjust the illumination level in one window (by turning a knob), to equal that in the other window. The left window revealed a black and white checkerboard (0.23 cycles per degree) while the right window revealed a white and light gray checkerboard. Illumination in both windows was higher than in the tunnel. Experiment 2: Identical, except that the checkerboard had a higher spatial frequency (0.81 cycles per degree). Experiment 3: Illumination in the windows was lower than that in the tunnel. A low frequency checkerboard was used. In all three experiments, observer matches were based closely on the highest luminance, not average. Experiment 4: Using a data projector, two round spotlights were cast on a 128-patch Mondrian mounted on a lab wall. One spotlight fell on a region with a full range of patches from black to white, while the other spotlight fell on a region with a truncated range of

patches, only from black to mid-gray. Observers were instructed to adjust the illumination of one spotlight to match the other, using arrow keys on the keyboard. The spotlights were matched for highest luminance, not average. In all these cases the highest luminance in the field of illumination was perceived as white, laying the basis for a theoretical integration of lightness and perceived illumination.

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