WHY ARE CONTRAST THRESHOLDS SO HIGH?

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Contrast thresholds are about 100 times too high when compared with the limit imposed by fluctuation of quanta entering the pupil. It has been proposed that this inefficiency results from four factors: (1) failure to absorb or utilize quanta in the receptors, (2) added intrinsic noise, (3) mismatch of test target to available central template, and (4) intrinsic uncertainty regarding the test target.

Measurements of performance with noise added to the input are thought to enable the product of the first two factors to be estimated, and this can account for a ten- to twenty-fold elevation in contrast threshold. The third factor can be measured by optimizing the spatio-temporal shape of the target, and this lowers contrast threshold about three times.

Contrast discrimination is better than contrast detection, perhaps because it eliminates effects of target uncertainty, and this further reduces contrast threshold two to three times. A highest efficiency of about 30% leaves a discrepancy of less than two to account for.

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