

What is the best criterion for an efficient design of retinal photoreceptor mosaics?

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The proportions of L, M and S photoreceptors in the primate retina are arguably determined by evolutionary pressure and the statistics of the visual environment. Two information theory-based approaches have been recently proposed for explaining the asymmetrical spatial densities of photoreceptors in humans. In the first approach Garrigan et al (2010 *PLoS ONE* **6** e1000677), a model for computing the information transmitted by cone arrays which considers the differential blurring produced by the long-wavelength accommodation of the eye's lens is proposed. Their results explain the sparsity of S-cones but the optimum depends weakly on the L:M cone ratio. In the second approach (Penacchio et al, 2010 *Perception* **39** ECVS Supplement, 101), we show that human cone arrays make the visual representation scale-invariant, allowing the total entropy of the signal to be preserved while decreasing individual neurons' entropy in further retinotopic representations. This criterion provides a thorough description of the distribution of L:M cone ratios and does not depend on differential blurring of the signal by the lens. Here, we investigate the similarities and differences of both approaches when applied to the same database. Our results support a 2-criteria optimization in the space of cone ratios whose components are arguably important and mostly unrelated.

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