

A possible origin of the inverted vertebrate retina revealed by physical modeling

Journal of Biological Physics, Jan M.M. Oomens, independent researcher

oomens-science@ziggo.nl

Normalized photoreceptor density equations (2&3) where angles can be entered in degree.

Equation 2 & 3, normalized local receptor density

angles θ and $\theta_{\max}$ in degrees ($^{\circ}$): boundary condition $0^{\circ} < \theta^{\circ} \leq \theta_{\max}^{\circ} < 180^{\circ}$

Equation 1

$$\frac{\rho}{\rho_c} = \frac{R_c^2}{R^2} \cdot \frac{1}{\left(\frac{\theta_{\max}^{\circ}}{57.296^{\circ}}\right)^2} \cdot \frac{\frac{\theta^{\circ}}{57.296^{\circ}}}{\sin\left(\frac{\theta^{\circ}}{57.296^{\circ}}\right)} = \frac{R_c^2}{R^2} \cdot \frac{57.296^{\circ}}{(\theta_{\max}^{\circ})^2} \cdot \frac{\theta^{\circ}}{\sin\left(\frac{\theta^{\circ}}{57.296^{\circ}}\right)}$$

Equation 2

$$R = R_c$$

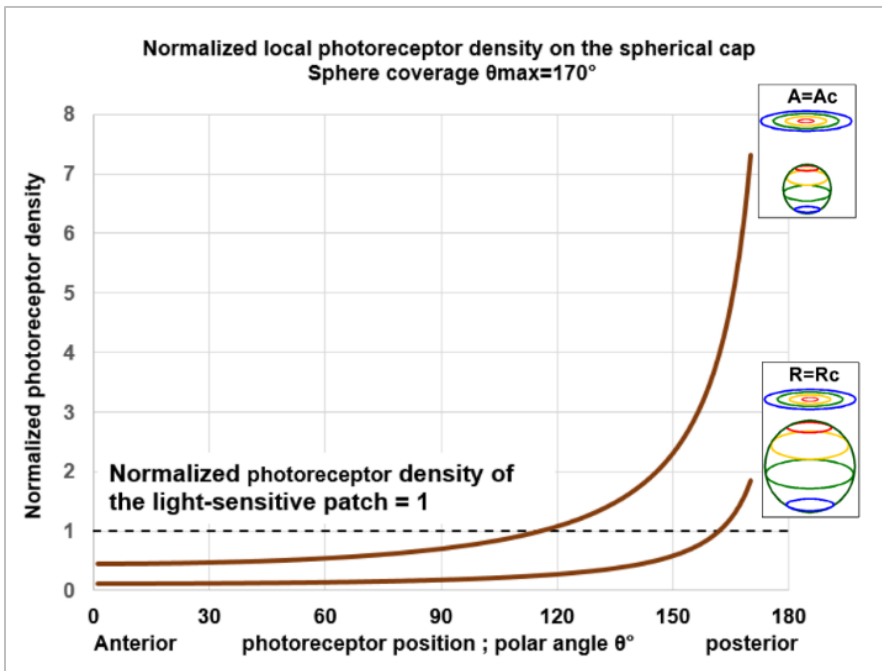
$$\frac{\rho}{\rho_c} = \frac{57.296^{\circ}}{(\theta_{\max}^{\circ})^2} \cdot \frac{\theta^{\circ}}{\sin\left(\frac{\theta^{\circ}}{57.296^{\circ}}\right)}$$

Equation 3

$$A = A_c ; \quad \frac{R_c^2}{R^2} = 2 \cdot \left(1 - \cos\left(\frac{\theta_{\max}^{\circ}}{57.296^{\circ}}\right)\right)$$

$$\frac{\rho}{\rho_c} = 2 \cdot \left(1 - \cos\left(\frac{\theta_{\max}^{\circ}}{57.296^{\circ}}\right)\right) \cdot \frac{57.296^{\circ}}{(\theta_{\max}^{\circ})^2} \cdot \frac{\theta^{\circ}}{\sin\left(\frac{\theta^{\circ}}{57.296^{\circ}}\right)}$$

Equation 2 & 3 expressed in degrees.



Equation 3 is used to calculate the constant surface area curve in figure 7. Top curve.

Equation 2 is used to calculate the constant radius curve in figure 7. Lower curve.