Title: Visual sensitivity and optics of nocturnal and diurnal frogs: a comparative approach

Abstract:

Studies of the visual system often employ analog models, and few data are available on the degree of control in natural and physiological parameters. In the present study, we measured light sensitivity and color vision in nocturnal and diurnal frogs, using electrophysiological techniques. The nocturnal species, Rana pipiens, have an extensive network of retinal ganglion cells, with a higher proportion of blue-sensitive ganglion cells. The diurnal species, Hyla cinerea, have a reduced network of retinal ganglion cells, with a lower proportion of blue-sensitive ganglion cells. These results support the hypothesis that the visual system of nocturnal animals is better adapted to low-light conditions, while the visual system of diurnal animals is better adapted to high-light conditions.

Correlation of Physiological Threshold and Optical Sensitivity

Having measured physiological thresholds in nocturnal and diurnal frogs, we correlated these data with the optical properties of the eyes. We found a strong correlation between the physiological threshold and the optical sensitivity, with nocturnal species having a lower optical sensitivity than diurnal species.

Pupil Diameter and Focal Length

The pupil diameter and focal length of the eyes of nocturnal and diurnal frogs were also measured. Nocturnal species have smaller pupils and shorter focal lengths than diurnal species, indicating that they are better adapted to low-light conditions.

Conclusion:

The results of this study support the hypothesis that the visual system of nocturnal animals is better adapted to low-light conditions, while the visual system of diurnal animals is better adapted to high-light conditions. Further research is needed to understand the mechanisms underlying these differences in visual sensitivity and optics.