LETTER TO THE EDITOR

Models of the Latency of Phototransduction Must Explain the Localized, Cooperative Interaction between Effective Photons

Dear Sir,

We agree with the basic strategy that Kraemer et al. (1989) outline for fitting the initial response of *Limulus* ventral photoreceptors to flashes of light. It now seems probable that the single photon event ("bump") arises from two separate processes, one governing the variable latency before the bump occurs and the other the amplitude and time course of the bump itself. It is reasonable, therefore, to attempt to explain our observations on the initial response to flashes of light in terms of the latencies of individual bumps.

However, we would caution that the reduction in response latency with increasing stimulus intensity cannot be simply explained by the competition of a large number of independently initiated bumps for the shortest latency. In our paper we compared responses to a 10–15 μm diameter spot of light to those produced by a diffuse light that produces the same number of bumps within the much larger, 50 μm diameter, light-sensitive lobe of the photoreceptor (Payne and Fein, 1986, Fig. 3). When more than 100 effective photons were delivered by either light flash, the latency of the response to the spot was much less than that of the response to the diffuse light. Since the same number of photons are effectively absorbed in each case, this result would appear to indicate that within the area stimulated by the spot of light, there was some degree of localized cooperative interaction, between the processes that determine the latency of the individual bumps.

Therefore, in explaining the latency of the response to bright flashes in terms of individual bump latencies it will be necessary to specify further details, such as the presence of cooperativity between the processes initiated by individual effective photons. We hope that our observations on the averaged response will be of use in determining likely models.

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REFERENCES

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