TABLE VI

Values of the amplification constant $A = \tau_\Phi^{-2}$ estimated from responses to dim flashes for photoreceptors of various species

The table gives values of the characteristic time constant of transduction, τ_Φ and the amplification constant $A = \tau_\Phi^{-2}$, estimated from the experiments of a number of groups on both rods and cones from various species. For complete response families, the values were estimated as described in the text and captions for Figs. 8 and 9. For dim-flash responses, τ_Φ was calculated by fitting a parabola to the initial rising phase of the response, as shown in Fig. 10. It can be shown that $\tau_\Phi \approx (t - t'_{\mathrm{eff}})\sqrt{\left(\frac{1}{2}\Phi/\{r(t)/i_{dark}\}\right)}$, where t is any time in the parabolic portion. The time t of measurement was selected as a point prior to the inflection in the rising phase of the dim flash response; $r(t)/i_{\mathrm{dark}}$ is the normalized response at that time, Φ is the number of isomerizations delivered at $t = 0$, and t'_{eff} is the effective delay time. Note that t'_{eff} is larger than t_{eff}, since it must include allowance for the low-pass analogue filtering and for the cell's capacitive time constant.

Assumptions. For the toad and salamander rod experiments (section A), at room temperature and filtered typically DC to 20 Hz, the total effective delay t'_{eff} was taken as 50 ms. For the lower vertebrate cone experiments (section B), typically filtered DC to 50 Hz, t'_{eff} was taken as 10 ms for turtle cones, and as 20 ms for salamander cones, which have a longer electrical time constant. For the mammalian experiments at about 37°C (sections C and D), t'_{eff} was taken as 5 ms. The numbers of isomerizations were either given by the authors or were calculated from their light intensities; the latter calculation used the authors' quoted effective collecting area where available, but where this was not given we calculated it from standard cell dimensions and pigment absorptions. In some of the studies the temperature was not available (indicated – in the Table) but was probably 20–22°C.

Species, cell	T (°C)	τ_Φ (s)	A (s^{-2})	Reference	This paper
A. Amphibian red rods					
Toad	–	2.8	0.13	[15, Figs 10, 11]	
(Bufo	–	3.1	0.10	[16, Fig. 4]	Fig. 10
marinus)	22	3.0	0.11	[17, Fig. 4]	
	–	4.0	0.063	[111, Fig. 6]	
	25.6	3.2	0.098	[106, Fig. 12]	
	{13.3	6.7	0.022}	[106]	
Mean at about 22°C:		3.4	0.100		
Salamander	20.4	4.8	0.043	[18, Fig. 3]	
(Ambystoma	23.7	3.9	0.066	[110, Fig. 12]	
tigrinum)	21.6	4.2	0.057	[180, Fig. 5]	
	22.5	5.6	0.032	[41, Fig. 2C]	
	–	3.9	0.066	[78, Fig. 2]	
	24.2	5.6	0.032	[60, Fig. 10]	
Mean at about 22°C:		4.7	0.049		
Newt *(Triturus cristatus)*	–	4.1	0.060	[63, Fig. 1A]	
B. Lower cones					
Turtle	21	1.5	0.44	[14, Fig. 3]	
Salamander	24.3	1.9	0.28	[127, Figs. 2, 4]	
Salamander	23	2.0	0.24	this paper	Fig. 9
C. Mammalian rods					
Human	37	0.26	15	[31]	Fig. 8D
Monkey	36	0.50	4.0	[19, Fig. 3]	Fig. 10
Monkey	36	0.36	7.7	[19, Fig. 1]	Fig. 8C
Cat	39	0.32	9.8	[176, Figs. 1, 3]	
Guinea-pig	35	0.44	5.2	[126, Figs. 2, 6]	
D. Mammalian cones					
Monkey	37	0.62	2.6	[20, Fig. 2]	
Squirrel	35	0.48	4.3	[102, Fig. 3]	