Time-resolved Recording of the Fast Rise of the R_1-component of the "Early Receptor Potential" (=ERP).

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The R_1-component of the ERP from isolated cattle retinas is studied at different temperatures with high time resolution using laser flash excitation and a very high impedance 1 MHz amplifier. In order to distinguish between relaxation processes occuring within the retina and relaxations introduced by the non-ideal measuring system, a method of variable amplifier input capacitance is applied. The R_1-phase is found to exist at all temperatures in the range between 0 ^{o}C and 37 ^{o}C, it's amplitude being independent of temperature. Under conditions where the detection electronics does not influence the signal transmission the rising phase of R_1 possesses an intrinsic time constant of about 0.6 µs at 0 ^{o}C. This time constant increases to about 1.6 µs at 37 ^{o}C. The negative temperature coefficient indicates that this rise-time represents a R·C-relaxation burried within the photoreceptor cells rather than a step in the photolysis sequence of rhodopsin. It is likely that the underlying molecular event of a charge redistribution at the photoreceptor cell membranes is much faster than the externally appearing signal. This event might be the charge separation connected with the cis-trans isomerization of visual pigments according to a model outlined recently (1).

1. Honig, B., Ebrey,T., Callender,R.H., Dinur,U. and Ottolenghi,M. (1979) Proc. Natl. Acad. Sci. USA 76,2503-07.