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Isolation of components in the retinal action potential of the decerebrate dark-adapted cat. By RAGNAR GRANIT.

Leads from the cornea and decerebration wound have been taken to the input of a directly coupled amplifier with a string galvanometer in the bridge formed by two valves working in a "push pull" arrangement. The aim of the work has been to try to establish a biological solution of the well-known complex action potential of the retina. In view of the high degree of differentiation of the cells in the various layers of the retina, the plan adopted was to look for an agent capable of influencing some parts of the action potential without interfering with others. Ether was chosen first for various reasons and was found to be satisfactory.

Etherization of a preparation, stable for several hours, removes in three characteristic steps definite components of the response to stimulation with white light. These components are indicated in Fig. 1 by the Roman letters in the order of their disappearance. Process I (P I) disappears rapidly during progressive etherization and the fast components are left unchanged. It is essentially a high-intensity process. Thus at a certain early stage of anæsthesia the slow component may be minute or even absent at high intensities whereas the low-intensity action potential is almost or even completely unchanged. Therefore the slow so-called *c*-wave of the composite potential is not homogeneous (see Fig. 1). P II next becomes sluggish during continued anæsthesia and ultimately disappears. Finally only the negative P III is left, provided the intensity has been high enough to elicit a negative component. So far the changes are reversible. The last stage is a gradual disappearance of P III. The changes have then become irreversible.

Records from the optic nerve indicate that P II is the component chiefly responsible for the impulses. P III has not been found associated with the setting-up of impulses. P I *may* promote the discharge but appears to be much less effective than P II, if at all so. The optic nerve discharge does not cease on removal of P I. The nerve records were obtained with needle-electrodes [Adrian and Bronk] stuck into *foramen opticum*, the galvanometer serving as an integrator.

It has been possible to confirm the relative independence of the three components in experiments where for some reason or other certain components have been lacking from the beginning.

The analysis of the experimental evidence supports the conclusion that the three processes pictured in Fig. 1 are the normal components of the action potential of an animal possessing very few cones. The initial negativity (*a*-wave) and the off-effect (*d*-wave) are recognized to be small and inconstant in certain mammals including the cat. Their place in the solution of the composite effect can be seen in Fig. 1. The typical off-effect is a retardation in the drop of potential following the removal of the stimulus. It may then be visible in the record from the optic nerve.

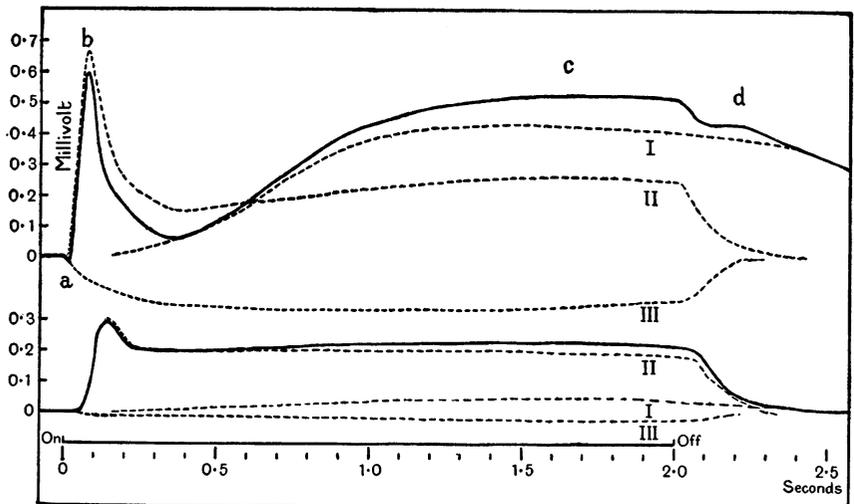


Fig. 1. Diagram showing solution of composite retinal action potential at two intensities of illumination in the ratio of 100 : 1. Broken lines: components. Lines drawn in full: action potentials as recorded; upper line in response to stimulus 100, lower line in response to stimulus 1. The *a*-wave is broadened slightly out of scale in order to show its derivation more clearly.

Observations on absence of cyanosis at great altitudes.

By RAYMOND GREENE¹.

During the summer of 1931 I was a member of the expedition which made the ascent of Kamet, a mountain in the Himalayas 25,447 ft. in height. During the ascent I kept careful observation on the colour of the

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