mixed red blood corpuscles rapidly with an equal volume of serum previously saturated with CO_2 and found that the HCO_3'—CO_2 equilibria were established in less than 1 sec. Investigation disclosed a possible explanation for the lack of effect with the manometric technique, as follows. During the time (about 10 min.) between measuring the corpuscles into the buffer and beginning the manometric observation the Cl′ inside the corpuscles exchanges with HPO_4'' from outside. Phosphate diffuses across the corpuscle membrane too slowly for rapid exchange with bicarbonate, and, as the corpuscle Cl′ is now exhausted, no catalysis occurs. The conditions were therefore altered to prevent exhaustion of the chloride and experiments were done both with CO_2 uptake and output. In each case a small catalysis was observed at the *beginning* of a run. The initial (catalysed) rate was the maximum the apparatus could record and its duration was proportional to the amount of corpuscles used. Hence, Cl′ no longer being the limiting factor, some other capacity effect must be operative.

The second accessibility factor is doubtless the H^+ which is required for conversion of HCO_3' to H_2CO_3 or vice versa. These ionic reactions can occur in the external buffer solution, but inside the corpuscles *in vitro* they depend upon the buffer capacity of hæmoglobin. When this is exhausted catalysis ceases. *In vivo* additional buffering is provided by the simultaneous oxygenation or reduction of hæmoglobin.

The conclusions are established that, *in vitro*, (1) corpuscles, although rich in carbonic anhydrase, can only perform a given small amount of catalysis in each direction per cycle, and (2) the cellular enzyme cannot directly accelerate reactions occurring in the plasma.

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The "slow potentials" associated with excitation and inhibition in the excised eye. By RAGNAR GRANIT and P. O. THERMAN. (*From the Institute of Physiology, Helsingfors*)

From the point of view of recording potentials in the central nervous system it is instructive to consider the result of an analysis of "slow potentials" in the nervous structure composed of an enucleated, opened

frog's eye with its optic nerve. The recording apparatus is a cathode ray oscillograph and a directly coupled amplifier. The four leads shown to the left in the figure are employed. Differentiation of the various components of the complex response is achieved by means of two known effects of potassium. A drop of an 0·5 p.c. solution of KCl on the retina (i) removes the discharge in the optic nerve before the retinal response is diminished, and then (ii) attacks the retinal response to illumination so that the positive component P II is selectively removed and the electroretinogram only consists of the negative component P III.

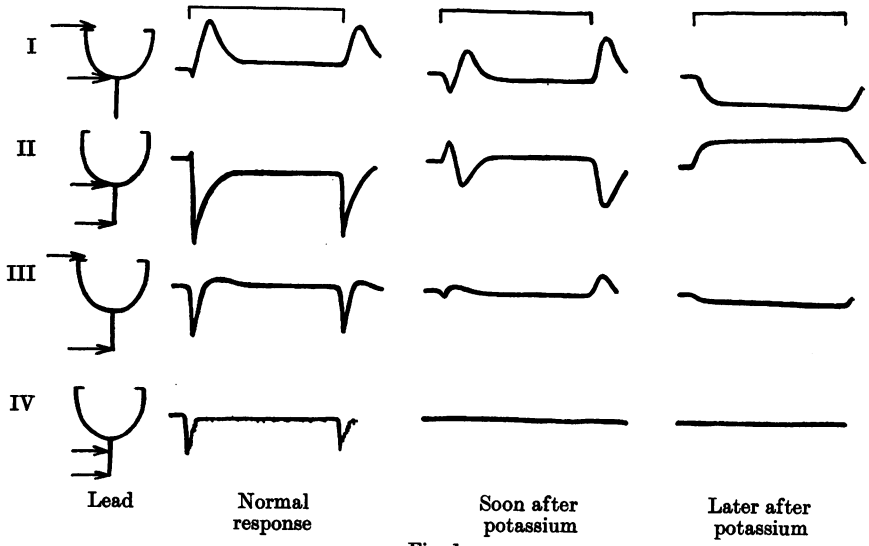

Fig. 1.

Lead I is the standard lead for recording the electroretinogram of an excised opened eye. Lead IV is the one generally employed for picking up the impulses in the optic nerve. For all leads positivity of upper electrode relative to lower electrode is plotted upwards in the figure. The complex normal responses in leads II and III are largely due to negativity along the nerve. The large negative deflexions diminish when the nerve is pinched near the bulb and disappear when, "soon after potassium", the nerve ceases to respond. Lead II then, as is to be expected, gives an inverted electroretinogram, lead III a small normal electroretinogram. In this phase lead I may give normal responses but generally they are changed in the direction illustrated. When finally the retinal response, "later after potassium", consists of a pure negative P III, this is inverted in lead II and normal but very small in lead III. The return to the base

line of the negative P III reproduces the properties of the off-effect when wave-length, intensity or state of adaptation is varied.

The experiments show that two processes of opposite sign can be localized to the retina. When the latter is removed from the eye it soon dies, but it lives long enough to show that with the positive component P II the sensory epithelium is *negative* relative to the ganglion layer, whereas with the negative component P III the free end of the sense cells is *positive* relative to the ganglions (as the results of Fig. 1 suggested).

It has previously been shown that the components P II and P III are associated with respectively excitation and inhibition in the optic nerve. With the aid of a double-ray oscillograph and a pair of condenser coupled amplifiers simultaneous records with leads I and IV have now been taken. (These enable a more accurate estimation of the moments of onset of excitation or inhibition in retina and nerve than previously has been possible.) For this purpose it has been necessary to use the off-effect where either process can be selectively elicited in the retina. It is found that a deflexion in the direction of P II begins in the retina before the nerve discharges. The onset of inhibition is preceded by or coincides with the appearance of the component P III in the retina. Such results would not be expected if P II and P III were after-potentials. The retinal potentials do not show the pharmacological properties characterizing after-potentials.

We do not know whether either component *causes* excitation or inhibition or both. The evidence available only shows them to be genuine slow potentials in the retina, regularly associated with excitation (P II) and inhibition (P III) in the manner described. They seem to spread electrotonically, as is best shown by the fact that rod and cone potentials are mutually refractory though elicited by different receptors (differentiation by the aid of wave-length).

Osmotic pressures and albumin-globulin ratios of sera of normal and immunized rabbits. By G. S. and M. E. Adair. (*From the Departments of Physiology and Pathology, Cambridge*)

Govaerts [1927] reported that the osmotic pressure of human serum was a function of the albumin-globulin ratio and gave a formula for the calculation of the osmotic pressure of serum. Wells *et al.* [1933] stated that Govaert's formula was unreliable and concluded that the ratio p/C, where p=osmotic pressure and C=concentration of total protein