measurement of rates of oxygen consumption at progressively decreasing substrate concentrations, it is considered that the latter value for the ratio K_m^D/K_m^H, obtained by an indirect method in which the enzyme reaction is always proceeding at its practical maximum velocity, is more nearly correct.

This work was carried out while I was in receipt of a personal grant from the Medical Research Council, which I gratefully acknowledge.

M. B. THORN*

Department of Biochemistry,
University College,
London.
Jan. 11.

* Present address: Department of Chemistry and Biochemistry, St. Thomas's Hospital Medical School, London, S.E.1.

[1] Lineweaver, H., and Burk, D., *J. Amer. Chem. Soc.*, **56**, 658 (1934).
[2] Haldane, J. B. S., "Enzymes" (Longmans, Green and Co., London, 1930).

Electrokinetic Potential of Barium Sulphate

THE electrokinetic potential of barium sulphate has been investigated repeatedly; but the results of various authors show no agreement either with respect to the sign of the potential or its magnitude. Most investigators, except Michaelis and Dolan[1], find the solid negatively charged, and Ruyssen[2] has recently reiterated his opinion that the pure salt has a negative charge in water. We have subjected this problem to a careful investigation[3] and found that precipitated as well as recrystallized barium sulphate, ignited immediately before establishing contact with water, has a well-reproducible positive potential against its saturated solution in water and in alcohol–water mixtures, provided that traces of surface-active impurities, which may originate from rubber joints and are not always absent even in double-distilled water, are rigorously excluded. An all-glass streaming potential apparatus and a procedure of freeing distilled water from traces of surface-active impurities (distillation from acid potassium permanganate solution) has been described recently[3]. The barium sulphate crystals retain a constant positive potential on ageing in water, irrespective of the quantity of water that is streamed through the plug. However, when ordinary distilled water, or water that was in contact with rubber or filter paper (cf. Ruyssen's experimental method[4]), is streamed through a plug of barium sulphate crystals, the positive potential decreases and changes to negative. Even leaving the crystals with water in a vessel that is open to the laboratory air for several days may cause a decrease of the positive potential. Obviously surface-active impurities are strongly adsorbed on the surface of the barium sulphate crystals. However, the original positive potential is restored on ignition of the crystals to 500–700° C., or on treatment with hot concentrated nitric acid, whereby the impurities are destroyed.

Although ignition is the most convenient method for obtaining barium sulphate crystals which show reproducible positive potentials, it is by no means essential. Precipitated barium sulphate has a positive potential without previous ignition provided solutions freed from surface-active impurities are used in its preparation, and this potential remains unchanged on ageing in the streaming potential cell.

In view of these findings, it appears to be probable that the negative potentials obtained by several workers[2,4,5] are due to the presence of surface-active impurities which are difficult to eliminate completely. This is suggested also by the poor reproducibility of the results of some investigators. It is worth considering that the effect of such impurities in water will be different from that in alcohol–water mixtures.

We made similar observations with other sparingly soluble sulphates (lead and strontium sulphates). It would appear that the role of surface-active impurities requires careful attention in electrokinetic work, particularly with positively charged surfaces.

A. S. BUCHANAN
E. HEYMANN

Chemistry Department,
University of Melbourne,
Melbourne, Australia.
Jan. 1.

[1] Michaelis, L., and Dolan, S., *Kolloid Z.*, **37**, 67 (1925).
[2] Ruyssen, R., and Loos, R., *Nature*, **162**, 741 (1948).
[3] Buchanan, A. S., and Heymann, E., *Proc. Roy. Soc.*, A (in the press); cf. also *Nature*, **161**, 649 (1948).
[4] Ruyssen, R., *J. Phys. Chem.*, **44**, 265 (1940).
[5] Reyerson, L. H., Kolthoff, I. M., and Coad, K., *J. Phys. Chem.*, **51**, 321 (1947).

Evolution of the Giraffe

ACCORDING to Darwin the long neck of the giraffe is the result of natural selection acting through the animal's tree-feeding habit. He wrote: "the individuals which were the highest browsers and were able during dearths to reach even an inch or two above the others will often have been preserved"[1].

There are serious objections to this argument.

(1) During dearths, severe and frequent enough for natural selection to operate through leaf-shortage, the recurrent wastage of young giraffes would threaten the species with extinction.

(2) Under such extreme conditions of dearth the grass-eating African ungulates would also have been so short of food that it is difficult to see why more of them did not develop the leaf-eating habit and the excessively long neck.

(3) Bull giraffes tend to be several inches taller than the cows, so that during each dearth males would be naturally selected at the expense of the females—another factor likely to lead to rapid extinction.

An alternative theory free from these criticisms has occurred to me.

The most extraordinary anatomical feature of the giraffe is not the length of the neck but the length of the forelegs.

This extreme length of leg gives the animal a huge stride, so that in spite of a rather slow galloping rhythm it can move at speeds up to 32 m.p.h.[2].

The giraffe is actively preyed upon by lions and leopards. It is reasonable, therefore, to explain the excessive length of its forelegs as the effect of natural selection acting continually through the hunter–hunted relationship, as in the case of hoofed animals generally.

Now, like other ruminants, the giraffe requires a plentiful supply of water. The development of an increasing shoulder height, therefore, necessitated the development of a means of getting the head down to the water-level. Horses and antelopes solved this problem by the simultaneous development of a proportionately long neck. I believe the giraffe solved it in the same way. That the neck has elongated