$\varepsilon_{max.}$ is the unknown molecular extinction coefficient per chromophoric group. It follows, therefore, that $\varepsilon_{max.} = 65{,}000f$. If we accept the value for $E^{\frac{1 \text{ per cent}}{1 \text{ cm.}}}$ ($= 6{\cdot}6$ at 500 mμ) as given by Broda *et al.*[2] as a minimum value, it follows that the maximum value of the carrier weight is $65{,}000f \times \frac{10}{6{\cdot}6} = 98{,}500\ f$.

If we also accept Hecht and Pickels's[7] experimental value of 270,000 for the molecular weight of rhodopsin, it follows that the number of chromophoric groups per molecule will be not greater than $\frac{270{,}000}{98{,}500f} = 2{\cdot}74/f = n$ (say). Hence $f \geqslant 2{\cdot}74/n$.

If $n = 1, f \geqslant 2{\cdot}74$; if $n = 2, f \geqslant 1{\cdot}37$; if $n = 3$, $f \geqslant 0{\cdot}91$; and if $n = 4, f \geqslant 0{\cdot}68$. If it is assumed that the preparation of Broda *et al.* was not far from pure, we can draw some further conclusions. It seems unlikely that f is greater than 2 (see table), and hence $n = 1$ is unlikely to be true; f is also unlikely to be less than the minimum value (0·84) shown in the table for the possible precursors of the rhodopsin chromophore, and therefore a value of $n = 4$ is not likely. The effect of the solvent has been ignored and this will add to the difficulty of deciding between $n = 2$ and $n = 3$.

It will be seen, therefore, that the question posed by Weale cannot yet be answered finally, even when data on strictly relevant compounds are considered in the light of current quantum mechanical approximations. Either rhodopsin must be obtained pure or the structure of the chromophore must be unequivocally established.

It is hoped to present elsewhere a fuller account of the structure of rhodopsin and of the most probable value for $\varepsilon_{max.}$

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Species Differences in Insulins

From a study of a number of crystalline insulins from different animal species, Scott and Fisher[1] found that they all had the same microscopic appearance, sulphur content and physiological activity; and Wasserman and Mirsky[2] could find no immunological differences using sensitization and complement fixation experiments. It has thus often been concluded that different insulins are chemically identical, although almost all other proteins have been found to show species differences. The following experiment shows, however, that there are certain definite differences in the detailed chemical structure of insulins from different animal species.

Source of insulin	Serine	Glycine	Threonine	Alanine
Ox	++	+	—	++
Pig	++	+	+	+
Sheep	+	++	—	++

Samples of insulins derived from the ox, pig and sheep were oxidized with performic acid and the *A* fractions prepared[3]. There were no differences in the course of fractionation and separation into the two main fractions, *A* and *B*, indicating the same general overall structure. The *A* fractions were hydrolysed and the amino-acids identified and estimated semi-quantitatively by paper chromatography. There were considerable differences in the contents of the amino-acids, serine, glycine, threonine and alanine, but not of the other amino-acids. The most significant of these differences, which are summarized in the accompanying table, is the presence of threonine in the fraction *A* of pig insulin and its absence from the others.

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Primary Site of the Action of Cobalt in Ruminants

In the course of the first (1935–36) series of experimental investigations of the etiology of the fatal malady, coast disease, which affects sheep confined to the pastures of the calcareous littoral of southern Australia, we observed the dramatic improvement which supervened when sheep that were suffering acute symptoms were dosed with cobalt[1].

In general, the cobalt content of the tissues of the sheep which succumbed to the malady was considerably reduced; in some cases, however, the cobalt present in the liver and in other organs was of the same order of concentration as that found in healthy sheep grazed where deficiencies of this nature never appear. As the animals employed for these experiments were bred on normal pastures, it seemed probable that the cobalt which had accumulated in their tissues prior to their transfer to the deficient terrain exerted little, if any, influence on the progress of the symptoms which appeared afterwards.

Later, we established depots of cobalt in experimental sheep by introducing relatively massive doses of sparingly soluble cobalt subcutaneously, and observed no benefit from this procedure; although at any stage of the syndrome these sheep would respond immediately to very small quantities (0·1 mgm./day) of cobalt *per os*. On investigating the reason for this we obtained, in 1943–44, evidence which suggested that cobalt must be *ingested* if it is to be effective; when injected into the blood stream it exerted no beneficial effect, although the concentration of cobalt in the blood-stream and in the organs was by this means increased at least ten-fold.

The details of these experiments have not as yet been published. The results were reported to a meeting of the Nutrition Society[2] by Sir Charles Martin, and later referred to in a review by McCance and Widdowson[3].

The observations set out in the accompanying graph and explained in the legend are typical of this first