of neutral ammonium sulphate. The globulins precipitated between 0 and 0·25 saturation and the albumins of the same origin, caseine and egg-albumin, are apparently not oxidized by the same system.

Insulin oxidized by this enzyme system (better by the *o*-quinone, which is the first oxidation product of the real substrate, which is the *o*-dihydroxy-phenol 'activator'[2,3]) is completely inactivated (see also note below).

This new reaction is of obvious importance for biochemistry and immunology. Its possible physiological importance in the case of the inactivation of insulin by an enzyme plus an *o*-dihydroxy-phenol analogue of adrenalin is already self-evident.

Details of this work will be published elsewhere.

I wish to thank Prof. J. Roche, of the Collège de France at Paris and president of the Institut des Hautes Études at Tunis, Dr. M. Uzan, director of the Physiological Laboratory, and Dr. L. Sassi, former director of the Chemical Laboratory of the same Institute, for their hospitality. Thanks are due to Dr. L. Balozet, director of the Pasteur Institut of Tunis, for the gift of horse plasma and serum.

Note added in proof. Shortly after submitting this letter I obtained direct experimental evidence in favour of this thesis—criticized by Nelson and Dawson[4]—by making polyphenol-oxidase act on insulin through a 'Cellophane' membrane. In this arrangement the added *o*-dihydroxyphenol activator (adrenalin) is oxidized by the enzyme on one side of the membrane and reduced back by the 'substrate' on the other side; but enzyme and its apparent substrate are never in contact.

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Retinal Oxygen Supply and Macular Pigmentation

In a recent letter, Dartnall and Thomson[1] suggest that because blood-vessels are absent from the macular region of the human retina, this area might be expected to suffer from a relative anoxia compared to the rest of the retina. Since this is certainly not the case, they suggest that the yellow macular pigment may supply a secondary oxygen-carrying system.

There seems to be no good reason for supposing that the absence of vessels in this region would result in any lack of oxygen supply to the foveal end-organs or their synapses. The inner layers of the retina (bipolar cells, ganglion cells and fibre layers) are dependent on the retinal circulation for their blood supply, but the visual end-organs (rods and cones) derive their nourishment from the choroidal blood-vessels. At the fovea the normal spatial relationship between the cones and the choroidal circulation is not altered, and, although the retinal vessels are displaced from the central area, so are the bipolar and ganglion cells connected to the foveal cones.

Dartnall and Thomson quote two investigations in which sparing of central vision was found under conditions of general anoxæmia and imply that these results support their hypothesis as to the function of the macular pigment. But in both the cases quoted the unaffected area was much larger than that which contains macular pigment; Evans and McFarland[2] found that central vision was spared for about 8–10° and Livingston[3] for well over 20°.

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Dr. M. H. Pirenne and Mr. E. J. Denton[1], Prof. H. Hartridge[2] and Dr. K. Tansley (above) have produced criticisms of our recent suggestion[3] that the macular pigment may play a part in supplying oxygen to the foveal region of the retina. Our replies to the main points in their criticisms are as follows.

(1) *That the macular pigment is produced by a post-mortem or pathological process and does not exist in the living healthy retina* (H. H.). This is an old point of controversy. Our belief in the existence of the macular pigment in the normal eye is based principally on Wald's recent work[4]. By subtracting the logarithm of the sensitivity curve for the macular region from that for an extra-macular region, Wald has produced a curve which, except in so far as it is complicated by any sensory differences that may exist between the two regions, gives the optical density of the macular pigment in the living eye. His results show that the density of the macular pigment *in vivo* varies with wave-length in much the same way as do the macular extracts of postmortem eyes.

Wright's method[5] of presenting the colour mixture data, so far from excluding the effect of pre-retinal pigmentation upon the measurements as Prof. Hartridge suggests, enables one to separate the effects of varying pigmentation from differences in the sensitivity of the retinal mechanisms. Thus mechanism variation affects the values obtained for the spectral coefficients, and pigment variation affects the position in the colour diagram of the white points. Pigment, in this context, denotes total pre-retinal pigment and includes lens as well as macular pigmentation.

Prof. Keilin has kindly directed our attention to an observation made by Dr. Smith and himself[6] in 1939. Examination of a continuous spectrum in a low-dispersion spectroscope revealed two diffuse absorption bands at 495 mμ and 455 mμ. They suggested that this phenomenon is due to the presence, probably in the macula and fovea, of either a flavin or a carotinoid or a mixture. They also noted that the two depressions detected by Gibson and Tyndall[7] in the spectral sensitivity curve of the eye occurred at similar wave-lengths.

The cause of 'fading' in the 'purple field' experiment, mentioned by Prof. Hartridge, is, in our opinion, the same as that which causes the shadows of the retinal vessels, demonstrable for a short time by oblique illumination, to 'fade'; namely, an adaptational change.

(2) *That there is no correlation between the extent of yellow pigmentation, the area lacking in blood vessels and the visual angle of spared vision in anoxia* (M. H. P. and E. J. D., and K. T.). One of us (L. C. T.) has obtained evidence[8] from a detailed examination of foveal spectral sensitivity data which