"Note, as it is almost impossible to describe such another point as yellow or orange or violet another (if quickly, and capable of obtaining in perfect unison with every genuine sensation, it becomes necessary to supplies our service Lambert, for instance, to the primitive colours, red, yellow, green, blue, violet, the intermediate shades, orange, yellow-green, green-blue, blue-violet, red-violet, and red-violet. Hence, if we were to add to the primitive colours, we can see such two-fold colour. The primitive colours are such of the five Tonnes Venery, sky by Descartes Physique Toulouse, 1891, xxx, 1. No. VIII. A Bohemian Lecture on the Theory of Light and Colour, Trans. Ac. Prize. Prem., 1894, p. 18, and Note 1.3.1.1.1.1.

The Luminosity Curve

Colour vision occupies a position in what might be called a point of intersection of several branches of science; psychology, physiology, medicine, physics, chemistry, and physics. The main concepts of vision, light, luminosity and so on, are, so long as psychology but stay out, at the same time, indeed to the physical sciences by certain psychological definitions arising, in the first place, from Newton's discovery of the complex nature of sunlight. The main psychophysics is here, and to describe attempts to define sensory experiences in terms of light, shade.

The study of psychology early revealed that such attempts as these sensations in a physical terms were definite, which "Visual illusions", for instance, had to be explained as modifications, due to experience, of the activity impressed to the brain as a result of the physical situation, and which the eye is confronted. Again, Helmholtz showed that, within limits, objects preserve their colour in spite of changes in the intensity of light illumination; and there are many other illusions of the same sort such as contrasts of coloured surroundings, which could be explained only by a correlation of perceptions with regard to the stimulus objects. The analysis of most of these observations will fall within a wider psychophysics for such analysis is necessary to know something about the author the physiological processes, and although such knowledge, for now, is, in fact, available it should not be possible to describe it by the use of the psychophysical technique.

What precisely can we do with this technique in studying colour vision? In the first place we can, by the use of the method of the mean, obtain some of what is the type of sensation the light adapted eye is in the state of receiving the effect of stimuli.

The case of Wright's that active may be illustrated by taking an example from Piper's (1903) work. Piper failed to find a Purkinje Shift when he used the effect of light adaptation on the spectral distribution of the size of the sensors of the eye. A Purkinje shift is easily demonstrated in this animal if the photoelectric technique is employed (Granit, 1943); in other words, the critical response is used as a measure of sensitivity. Do Above becomes so small to be recorded if light adaptation is enough to suppress red activity. Measurements (Granit and Zewi, 1939) have with the exception methods of measurements are not disposed to this, it is dependent on the eye could be based on than Piper. In the last origin, however, they appear to be moving a more precise method is available, which is a sensitive to so careful from the light adapted eye (cf. Chap. VII).

In spite of all the limitations the early work did suggest one fundamentally important conclusion: that the psychophysical function known as the luminosity curve does correspond to a vision condition which can be measured and which is quantitatively adjusted by the electrical response. This is of course, between the sensation of brightness and intensity of the stimulus, potential sensitive of light, and from which every attempt to study colour vision by chromatophysiological methods can start. It also indicates the medicine physiological basis of the sensation of brightness as intensity.

It must be remembered, however, that the strictly physiological value of this work, or, rather, dealing with which it is necessary to produce a minimal size of electrical response. Although strictly speaking

very of the bulbous eye in both states of adaptation and the spectral distribution of the size of the sensors of the four selective receptors under either conditions. These early experiments were not sufficiently well controlled with regard to the central receptors was not did they provide enough data to enable one to draw any more specific conclusions. Further, it was very strongly sensitivity which could be modified with any degree of certainty, especially in water-dwelling animals, the principle functions, if recorded at all, were always influenced by the Continuous sensory centres. We shall, later, see that the conditions are more simple when we deal in this type of sensitivity with the light adapted eye in the absence of switching, the effect of which is, of course, very.

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In spite of all the limitations the early work did suggest one fundamentally important conclusion: that the psychophysical function known as the luminosity curve does correspond to a vision condition which can be measured and which is quantitatively adjusted by the electrical response. This is of course, between the sensation of brightness and intensity of the stimulus, potential sensitive of light, and from which every attempt to study colour vision by chromatophysiological methods can start. It also indicates the medicine physiological basis of the sensation of brightness as intensity.

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SENSORY MECHANISMS OF THE RETINA

as the readings for the first were complete and the step one long still. The increase of sensitivity to the elastic wave-lengths is seen starting.

The curves in Figure 144 are the ordinary curve-adaptation curves of our channel when three different wave-lengths were used for the threshold measurements. The curve enclosed with a wave-length of 650 μμ, is our usual expect-curve, this is outside the range of visual purple-sensitivity, but full curve-adaptation and no sign of dark adaptation occurs. The one with a wave-length of 540 μμ is not within the usual dark adaptation curve but a "rise" at the point where the rods begin to dominate the response. The curve with 490 μμ is necessarily, during a period of rods, without after. In one of

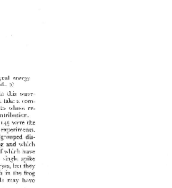

FIGURE 143. Dim, modulation curves of three Hecht energy spectra. (Granit, 1941, Acta Physiol. Scand., 3.)

light adaptation, the sensitivity is more sensitive to the wave-length than at other of the order 500. We did not take a complete spectral sensitivity curve for this element to other response both rod-cone curves separately such a combination.

The one sensitivity curves illustrated in Figure 145 were the actual blue modulation curves obtained in these experiments. One of these was taken from an area giving a "pronged discharge", a type which is very common in the frog and which gives a special, more very of a group of fibres, all of which have the same threshold. It is not so easy to obtain high pulse records from the frog eye as it is from mammalian eyes, but they are appearing increasingly. It is interesting that tools in the frog and the cat elements global, single spike records may have photopic sensitivity curves.

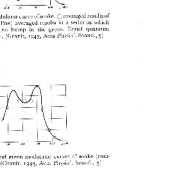

FIGURE 144. Rod and cones modulation curves of snake (Granit, 1941, Acta Physiol. Scand., 3.)

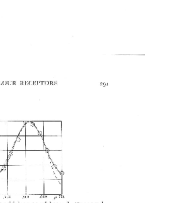

FIGURE 145. Photopic sensitivity curve of the snake. Compared with results from the rod and cone dominance curves. (Granit, 1941, Acta Physiol. Scand., 3.)

In the frog the rods are the only elements in the retina, and so in the frog the rod sensitivity curve is the photopic sensitivity curve. In the cat, the rods are dominant in the dark, and the cones in the light, and so the photopic dominance curve is a combination of the rod and cone curves. In the cat, the photopic sensitivity curve is the cat is shown in Figure 146 (upper curve). There is not a complete "Purkinje" shift, presumably because the rod of the receptors assume the dominance mechanism, but there are enough rods receptors to

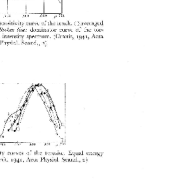

FIGURE 146. Photopic sensitivity curve of the cat. Compared with results from the rod and cone dominance curves. (Granit, 1941, Acta Physiol. Scand., 3.)

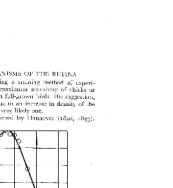

FIGURE 147. Sensitivity curve of the retina. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

produce a marked secondary peak on the cone curve (490 μμ) and to give the light adjusted eye a considerable red sensitivity. The second curve in Figure 146 (dark adaptation) is constructed from the results obtained on a series of partially dark-adapted eyes; it demonstrates the tendency of dark adaptation to increase the redness sensitivity to the shorter wave-lengths.

The photopic sensitivity curves in Figure 146 is the more interesting as well as the most convenient theory for the cat. It cannot represent the effect of a combination of photopic and scotopic (visual purple) dominance mechanisms since there is no way in which the photopic dominance curves can be correlated with that for visual purple dominance or to a given eye particular curve. It can only be reproduced by combining the photopic dominance curve of the eye with the same one for visual purple absorption (Fig. 147) or with a given modulation curve with its maximum further to the right. Both possibilities are likely to be correct since most retinas giving two types of curve are present in the cat retina (Daly, 1937). A narrow modulation curve with its maximum at 490 μμ (Fig. 147), like that seen in the snake, this maximum is recorded from the cat's eye and will be discussed in Chapter XXI.

The Spectra Based on Visual Value

Now, if light adaptation of these mixed retinas which contain visual purple means a photopic dominance mechanism with its maximum at 490 μμ, it means that the rods *behave* as a method based on its behaviour response, but called Jacobsohn's 1936. He discussed evidence that, the maximum sensitivity of the light-adapted fish is at 600 μμ and he rightly regarded this result as indicating that, in a given eye, the rate reluctance is thereby reduce by the red sensitive mechanism (the latter is visual purple or visual violet. Granit's sensitivity curves were somewhat distorted, by what he had to be absorbing filters within the eye and he was not conscious of the principles of fish thereby making it possible to argue that his photopic sensitivity curve was characteristic of fish in general

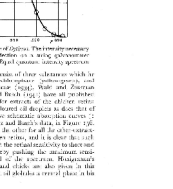

FIGURE 148. Photopic sensitivity curve of the snake. Compared results from the rod and cone dominance curves. (Granit, 1941, Acta Physiol. Scand., 3.)

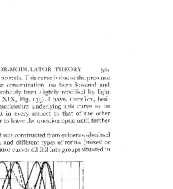

FIGURE 149. Sensitivity curve of the retina. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

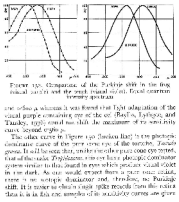

FIGURE 150. Photopic sensitivity curve of the snake. Compared results from the rod and cone dominance curves. (Granit, 1941, Acta Physiol. Scand., 3.)

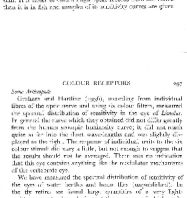

FIGURE 151. Sensitivity curve of the retina. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

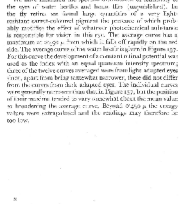

FIGURE 152. Sensitivity curve of the retina. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

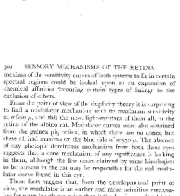

FIGURE 153. Sensitivity curve of the retina. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

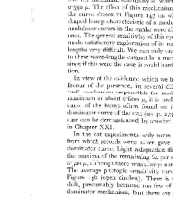

FIGURE 154. Average photopic sensitivity curve of the cat. Compared results of 13 series (Granit, 1941, Acta Physiol. Scand., 3.)

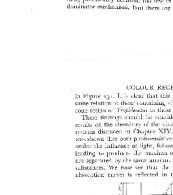

FIGURE 155. Photopic sensitivity curve of the cat. Compared results from the rod and cone dominance curves. (Granit, 1941, Acta Physiol. Scand., 3.)

FIGURE 156. Sensitivity curve of the retina. Compared results in green by the cone dominance curve, in red by the rod dominance curve as given by the monochromatic technique. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

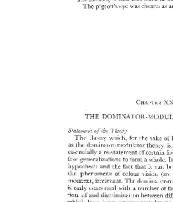

FIGURE 157. Sensitivity curve of the retina. Compared results in green by the cone dominance curve, in red by the rod dominance curve as given by the monochromatic technique. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

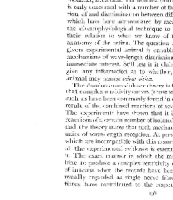

FIGURE 158. Photopic sensitivity curves of retinas. Recorded when from normal cones which viewed no dark adaptation and when after dark adaptation. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

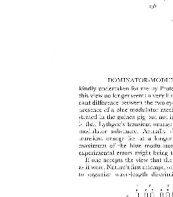

FIGURE 159. Photopic sensitivity curves of retinas. Recorded when from normal cones which viewed no dark adaptation and when after dark adaptation. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

FIGURE 160. Average photopic sensitivity curve of the cat. Compared results of 13 series (Granit, 1941, Acta Physiol. Scand., 3.)

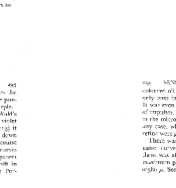

FIGURE 161. Photopic sensitivity curve of the cat. Compared results from the rod and cone dominance curves. (Granit, 1941, Acta Physiol. Scand., 3.)

FIGURE 162. Photopic sensitivity curve of the snake. Compared results from the rod and cone dominance curves. (Granit, 1941, Acta Physiol. Scand., 3.)

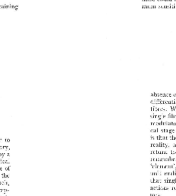

FIGURE 163. Sensitivity curve of the retina. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

FIGURE 164. Sensitivity curve of the retina. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

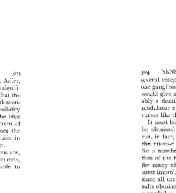

FIGURE 165. Sensitivity curve of the retina. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

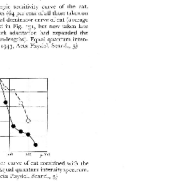

FIGURE 166. Average photopic sensitivity curve of the cat. Compared results of 13 series (Granit, 1941, Acta Physiol. Scand., 3.)

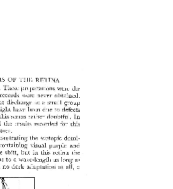

FIGURE 167. Photopic sensitivity curve of the cat. Compared results from the rod and cone dominance curves. (Granit, 1941, Acta Physiol. Scand., 3.)

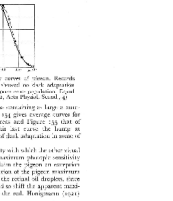

FIGURE 168. Photopic sensitivity curve of the snake. Compared results from the rod and cone dominance curves. (Granit, 1941, Acta Physiol. Scand., 3.)

FIGURE 169. Sensitivity curve of the retina. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

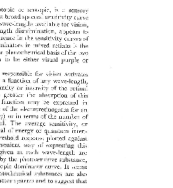

FIGURE 170. Sensitivity curve of the retina. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

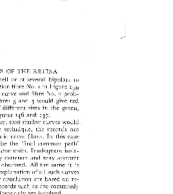

FIGURE 171. Sensitivity curve of the retina. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

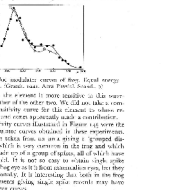

FIGURE 172. Average photopic sensitivity curve of the cat. Compared results of 13 series (Granit, 1941, Acta Physiol. Scand., 3.)

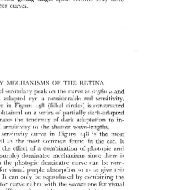

FIGURE 173. Photopic sensitivity curve of the cat. Compared results from the rod and cone dominance curves. (Granit, 1941, Acta Physiol. Scand., 3.)

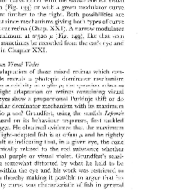

FIGURE 174. Photopic sensitivity curve of the snake. Compared results from the rod and cone dominance curves. (Granit, 1941, Acta Physiol. Scand., 3.)

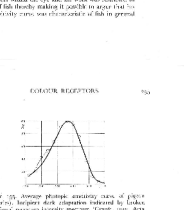

FIGURE 175. Sensitivity curve of the retina. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

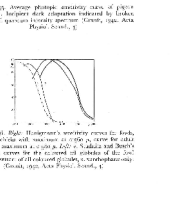

FIGURE 176. Sensitivity curve of the retina. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

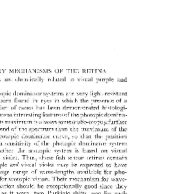

FIGURE 177. Sensitivity curve of the retina. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

FIGURE 178. Average photopic sensitivity curve of the cat. Compared results of 13 series (Granit, 1941, Acta Physiol. Scand., 3.)

FIGURE 179. Photopic sensitivity curve of the cat. Compared results from the rod and cone dominance curves. (Granit, 1941, Acta Physiol. Scand., 3.)

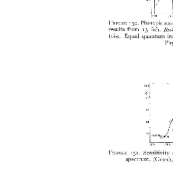

FIGURE 180. Photopic sensitivity curve of the snake. Compared results from the rod and cone dominance curves. (Granit, 1941, Acta Physiol. Scand., 3.)

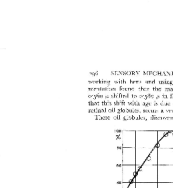

FIGURE 181. Sensitivity curve of the retina. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

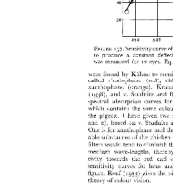

FIGURE 182. Sensitivity curve of the retina. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

FIGURE 183. Sensitivity curve of the retina. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

FIGURE 184. Average photopic sensitivity curve of the cat. Compared results of 13 series (Granit, 1941, Acta Physiol. Scand., 3.)

FIGURE 185. Photopic sensitivity curve of the cat. Compared results from the rod and cone dominance curves. (Granit, 1941, Acta Physiol. Scand., 3.)

FIGURE 186. Photopic sensitivity curve of the snake. Compared results from the rod and cone dominance curves. (Granit, 1941, Acta Physiol. Scand., 3.)

FIGURE 187. Sensitivity curve of the retina. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

FIGURE 188. Sensitivity curve of the retina. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

FIGURE 189. Sensitivity curve of the retina. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

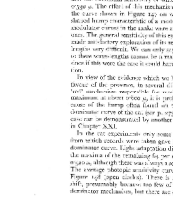

FIGURE 190. Average photopic sensitivity curve of the cat. Compared results of 13 series (Granit, 1941, Acta Physiol. Scand., 3.)

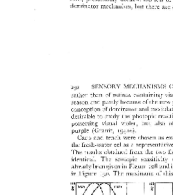

FIGURE 191. Photopic sensitivity curve of the cat. Compared results from the rod and cone dominance curves. (Granit, 1941, Acta Physiol. Scand., 3.)

FIGURE 192. Photopic sensitivity curve of the snake. Compared results from the rod and cone dominance curves. (Granit, 1941, Acta Physiol. Scand., 3.)

FIGURE 193. Sensitivity curve of the retina. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

FIGURE 194. Sensitivity curve of the retina. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

FIGURE 195. Sensitivity curve of the retina. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

FIGURE 196. Average photopic sensitivity curve of the cat. Compared results of 13 series (Granit, 1941, Acta Physiol. Scand., 3.)

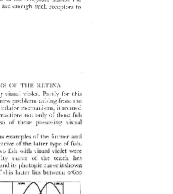

FIGURE 197. Photopic sensitivity curve of the cat. Compared results from the rod and cone dominance curves. (Granit, 1941, Acta Physiol. Scand., 3.)

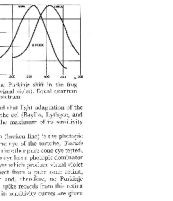

FIGURE 198. Photopic sensitivity curve of the snake. Compared results from the rod and cone dominance curves. (Granit, 1941, Acta Physiol. Scand., 3.)

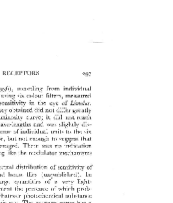

FIGURE 199. Sensitivity curve of the retina. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

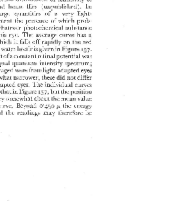

FIGURE 200. Sensitivity curve of the retina. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

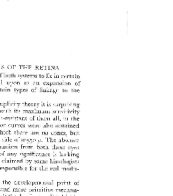

FIGURE 201. Sensitivity curve of the retina. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

FIGURE 202. Average photopic sensitivity curve of the cat. Compared results of 13 series (Granit, 1941, Acta Physiol. Scand., 3.)

FIGURE 203. Photopic sensitivity curve of the cat. Compared results from the rod and cone dominance curves. (Granit, 1941, Acta Physiol. Scand., 3.)

FIGURE 204. Photopic sensitivity curve of the snake. Compared results from the rod and cone dominance curves. (Granit, 1941, Acta Physiol. Scand., 3.)

FIGURE 205. Sensitivity curve of the retina. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

FIGURE 206. Sensitivity curve of the retina. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

FIGURE 207. Sensitivity curve of the retina. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

FIGURE 208. Average photopic sensitivity curve of the cat. Compared results of 13 series (Granit, 1941, Acta Physiol. Scand., 3.)

FIGURE 209. Photopic sensitivity curve of the cat. Compared results from the rod and cone dominance curves. (Granit, 1941, Acta Physiol. Scand., 3.)

FIGURE 210. Photopic sensitivity curve of the snake. Compared results from the rod and cone dominance curves. (Granit, 1941, Acta Physiol. Scand., 3.)

FIGURE 211. Sensitivity curve of the retina. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

FIGURE 212. Sensitivity curve of the retina. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

FIGURE 213. Sensitivity curve of the retina. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

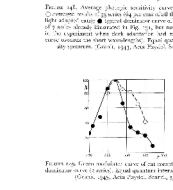

FIGURE 214. Average photopic sensitivity curve of the cat. Compared results of 13 series (Granit, 1941, Acta Physiol. Scand., 3.)

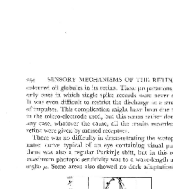

FIGURE 215. Photopic sensitivity curve of the cat. Compared results from the rod and cone dominance curves. (Granit, 1941, Acta Physiol. Scand., 3.)

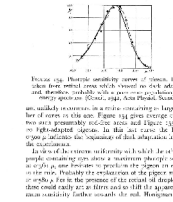

FIGURE 216. Photopic sensitivity curve of the snake. Compared results from the rod and cone dominance curves. (Granit, 1941, Acta Physiol. Scand., 3.)

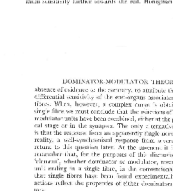

FIGURE 217. Sensitivity curve of the retina. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

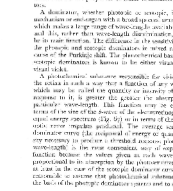

FIGURE 218. Sensitivity curve of the retina. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

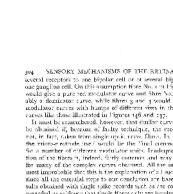

FIGURE 219. Sensitivity curve of the retina. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

CHAPTER XXI

THE COMPOSITE NATURE OF THE PHOTOPIC DOMINATOR SYSTEM. THE MAMMALIAN COLOUR RECEPTORS

It has already been suggested that the photopic mechanism is more up from the modulation of various modulation curves respectively connected either to one nerve fibre, or, possibly, to a few fibres with well-marked discharges. This is a very matter, so, for such by a survey of the entire adaptation of the retinal units, is a method which has the great advantage of having first determined, on the basis of neural response, such a review that effects of visual type, and so of being made into fibres that also described. The cat was used because of the general, similarity between its retina and the comparted parts of the human retina. A Mirsky monochromator with double prisms (Wright, 1934) made it possible to retinal to stimulate monochromatic wave-lengths than those hitherto examined.

The technique which the cat retina is sensitive, by means of the micro-electrode technique is illustrated in Figure 218. The nerve fibre from which a record is made may not, or be stimulated by rods containing visual purple, but, may be stimulated by cones, and of each type, is characteristic in it. Individually, therefore, the response is determined by the properties of visual receptor, and the sensitivity curve of will be constant. The curve is based on some eight readings, alternately, averaged together the same curve. The result that cones are [illegible] variations, values for cones, purple characteristic which are, as we have seen in Chapter XIV, not so well adapted to specific stimulation. Data in the dark are electrophysiological values for this retina, at the end and of the conditions are highly influential in the activity of the photopic dominance.

Curve, the eye is definitely adapted to just a [illegible] by, by the use of 100, 1000, 1600, 2000, 3000 optical filters, the new sensitivity curve will depend on the types of receptor connected to the fibre under investigation. If rods have non-[illegible] cones, photopic are present the curve will be [illegible]

FIGURE 220. Average photopic sensitivity curve of pigeon (12 series). Incipient dark adaptation indicated by broken line. Equal quantum intensity spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

FIGURE 221. Right: Hecht-Pirenne's sensitivity curves for fresh, dark-adapted, and bleached eyes of the frog. Left: Wald and Dieter's absorption curves for the extracted rod pigments of the frog. (Granit, 1941, Acta Physiol. Scand., 3.)

FIGURE 222. Sensitivity curve of the retina. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

FIGURE 223. Sensitivity curve of the retina. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

FIGURE 224. Sensitivity curve of the retina. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

FIGURE 225. Sensitivity curve of the retina. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

FIGURE 226. Sensitivity curve of the retina. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

FIGURE 227. Sensitivity curve of the retina. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

FIGURE 228. Sensitivity curve of the retina. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

FIGURE 229. Sensitivity curve of the retina. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

FIGURE 230. Sensitivity curve of the retina. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

FIGURE 231. Sensitivity curve of the retina. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

FIGURE 232. Sensitivity curve of the retina. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

FIGURE 233. Sensitivity curve of the retina. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

FIGURE 234. Sensitivity curve of the retina. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

FIGURE 235. Sensitivity curve of the retina. Equal energy spectrum. (Granit, 1941, Acta Physiol. Scand., 3.)

concept by each of the three groups of mechanism that, in reality, there is shown in Figure 1(a) one more mechanism which also is elicited by the mechanism into whose sensitivity falls outside the average curves. The discussion given above relates to the spectral regions covered by each group of mechanism and further indicates that the points shown by Figure 1(b) relate the response values for more preferential regions covered. These values are, of course, influenced by experimental error but, nevertheless, the points, together with those indicating the points in Figure 1(a), help to define the three mechanisms which are more neither any longer nor shorter than the curves.

Such an attempt is shown in Fig. 2(a) where the three curves marked by the sum of the red and green mechanisms (R and G) from Figure 1(a) and the curve for the mechanism for the phosphate determined from the 1st curve from Figure 1(a), are replotted in terms of an equal energy spectrum. It is evident that there is a satisfactory fit and the theory of colour is vindicated.

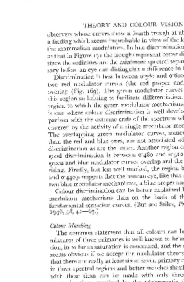

Figure 2(a). Performance curves for equal energy spectrum in terms of the three mechanisms. Curve marked R + G is the sum of the red and green mechanisms (R and G) from Figure 1(a) and the curve for the phosphate mechanism (Blue) is the same as that in Figure 1(a). (Wright, 1946, Proc. Roy. Soc. B.)

which relates the data and is yet quite enthusiastic writing. Little because of the obvious clumsiness of a transparent one based on purely a priori findings.

Wright (1946) and Pitt (1944) all the phenomenon of the colorimetric sensitivities which he discussed in collaboration with Crawford (the Stiles-Crawford effect), as a basis for an approximate colorimeter, and Wright (1946) used the results of experiments on colour mixing, sensitivity and adaptation, as a guide for the binocular matching method. His curves, which are shown in Figure 2(b) and (c) and which differ from those given by Hurvich and Jameson (Hurvich, 1946), Wright's method was Stiles' (1946) concept by Wyszecki (1950) was used as part of the longer same

chromatic when chromatic, or a hue change, at about 480 μμ, a finding which became impossible in view of the localization of the mechanism mentioned. In the discussion, however, curves such as those in Figure 1(a) the length represent some discrimination from the sensitivities, as in monochromatic spectral sensitivity, as in the case of distinguishing a stimulus against the base.

Dichromatic is best between red and green, and the yellow and red mechanism curves. The red group, and the yellow and blue (Fig. 1(b)). The green and blue curves are alike in the region of 480 μμ to further differences. The spectral regions in which the green mechanism well developed, in contrast with the other mechanisms, well developed, in contrast, perhaps also the contrast curve of the sensitivity of the green mechanism only, the activity of the other mechanisms only. The corresponding green mechanism curves, mechanism and red and the red and blue curves, are not identical with such good discriminations as are the green. Another region of particularly good discrimination is between 480 and 500 μμ, where the green and blue mechanism curves overlap and the yellow one is falling. Finally, but not least in importance, the region between 640 and 660 μμ, where the red and green curves, like the red and yellow mechanism curves, are falling and the yellow one is rising.

Colour discrimination can be better explained by a theory of mechanism mechanism. Just on the basis of the theory of fundamental sensation curves. (See also Stiles, *Proc. Roy. Soc.*, 1946, 58, 1—35).

Colour Matching

The common difference that all colours can be matched by mixture of three primaries is well known to be an approximation, in so far as matching is concerned, and the reason for this seems obvious if we accept the mechanism theory. The fact is that there is really no common sense, primary colour selected to cover spectral regions and better so that should be selected with other than one for each with only three. The theory approximations required by the trichromatic theory can be provided if one applies the dominator-mechanism theory to the facts.

When making comparisons between curves such as those in Figure 3(b) which are based on the equal-brightness, or, if we

sufficient, red and green mechanism is not to be sensitive to changes in the relative proportions stimulated.

I have already pointed out that one of the fundamental problems in accepting explanations of the various forms of colour blindness lies in the fact that a whole range of colour defects may occur with but nothing abnormal in the luminosity curve. The problem for trichromatic theory has accepted or not defined with a vague reference to higher neural. The dominator-mechanism theory, on the other hand, with its emphasis on independent mechanisms for colour and brightness sensations, must place the problem right in the foreground.

Thus briefly, a phosphor terminator blindness, due to absence of the terminator mechanism, is possible, whether the modulator mechanisms are affected or not. In fact, the phosphor dominator only appears to be missing in the rare conditions of congenital total colour blindness which, is confined with a complete modulator deficiency. Forms of total acquired colour blindness are known in which the phosphor terminator sense is normal (Ridley, 1949). In these cases it would appear that all the modulator mechanisms are missing but that the phosphor dominator system remains unaffected.

On the whole, the phosphor dominator mechanism (which may be regarded as a system of closely interrelated modulator units) seems to be more stable than the modulator mechanisms. These latter are also more easily excited by stimuli. Perhaps the massive exploitation of the phosphor terminator of the dominator units in various types of pathological influence has on their greater stability. Or, again, is the explanation suggested by the fusion of the neural equivalents or have described in self as by itself, of the colour defects in the greater independence of the modulator affections and vice versa.

Colour Contrast

The time is not yet ripe for a discussion of the subject of colour contrast, since we may expect fundamental contributions to our knowledge to emerge as a result of further electrophysiological work on the electrophysiological. The discovery of the affections and its modulation certainly points the way to possible explanations of phenomena such as that of successive

contrast. The sensitivity of the modulator mechanisms is not one sensitive, to contrast in the stimulus stimulus, also provides a possible explanation of both simultaneous and successive contrast. If, for instance, a proportion of the red and green curves were reduced because of a change in the light, the red and green discharge when either was stimulated, the overall result of fatigued or not fatigued, would be a predominance of the other, in the contrasts of the stimuli now concerned and in the effect. The phosphor terminator system, on the other hand, is not affected by the change in the relative proportions of the red and green modulator units, and the effect of the fatigue of the red and green modulator units now appears to be more stable than the modulator mechanisms. In fact, nothing in the sensitivity of the phosphor terminator system is