GLOSSARY DIAGRAMS (1)

The eye

The diagrams below and their captions provide a brief introduction to eye/brain systems that play a part in the artistic practices discussed both in the main books and in this Glossary. Figures 2 to 11 concern the often surprising organisation of the different cell-types in the retina with their network of neural connections. It is the activation and activity of these that initiates the process by which the eye/brain is able make practical use of the information contained in the ever-changing patterns of light coming into the eye.

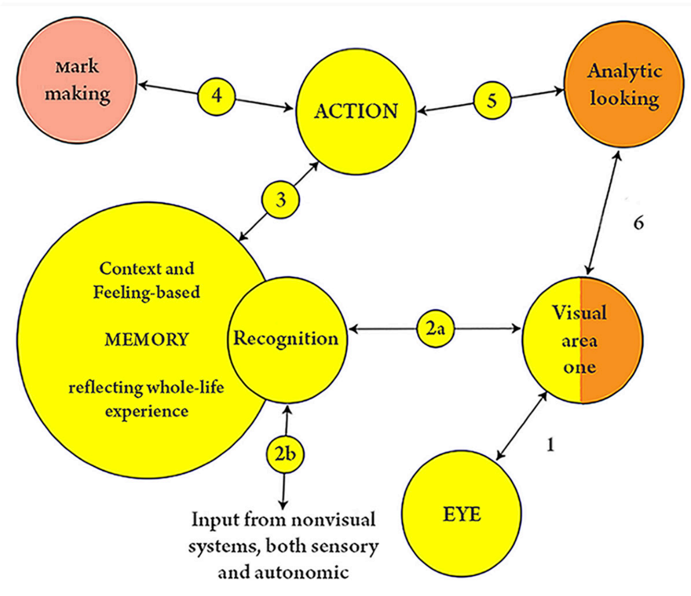

*Figure 1 is a flow diagram giving a much oversimplified idea of the flow of information within the analytic-looking cycle (the actual flow is far too complicated represent in such a clear way). In it the coloured discs can be related to regions in the **neocortex**, as illustrated in Figure 13. Notice that the disc labelled **Visual Area 1**, which takes input from the **retina** via the **optic nerve**, is divided into two halves. This division symbolises its double function of providing information (a) to the **preconscious** processes that enable **recognition**, and (b) to the subsequent **conscious** ones that accompany **analytic-looking**.*

*Also, the diagram indicates the key role of **memory stores** in enabling both **recognition** and **the organisation of action**. In particular, it calls attention to the importance of **context**, **feeling** and **whole-life experience** in building them up. The numbers indicate the direction of flow. Notice particularly that **recognition** and **access to memory** take place **before analysis**. In the language of "**Intellectual Realism**", this means that* we ***"know"***, *what we are looking at before we "**before we are consciously aware of it"***. Similarly ***recognition** and **access to memory** take place **before** the implementation of **actions** such as those that guide artist when **mark making**. The diagram also indicates the role of **nonvisual-inputs** in enabling **recognition**. For* *example, we may* ***recognise*** *something by its sound, smell or feel* ***before*** *confirming what it is visually.*

The main complications that is glossed over are the pathways implicating the old brain (mid brain), and in and, in particular, the ***superior colliculus****, the* ***pulvinar,*** *the* ***thalamus****, the* ***hippocampus*** and the ***amygdala,*** *and the* ***feeling centres***. These are involved, both when the direction of gaze is consciously driven and when it is *determined by attention-catching external events such as unexpected flashes of light, sudden sounds or movement.*

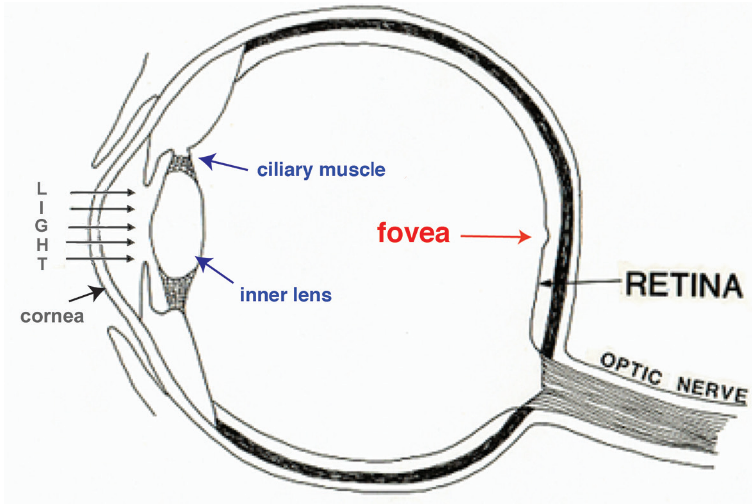

Figure 2 diagrams the retina at the back of the eye with the size of ***fovea*** *indicated. Before reaching the retina the light that passes through the cornea is focused by two lenses. One of these is the* ***cornea****, the other, the* ***inner lens*** *performs a fine focusing function. The information that has been gathered and processed is passed up the optic nerve to* ***visual area 1*** *(see Figure 1).*

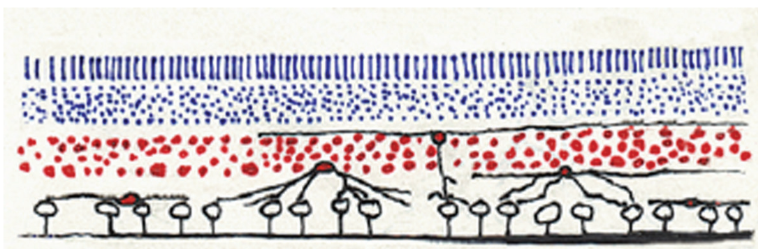

Figure 3 illustrates the layers of cells in the periphery of the retina. The row of vertical lines at the top represent a small proportion of the approximately ***150 million*** *rod receptors to be found there and the much smaller number of ring shapes at the bottom represent some of the approximately* ***one million*** *ganglion cells that channel the output from the retina up optic nerve. The huge difference between these two numbers gives an idea of the extent of the organisation of information that has taken place between the two.*

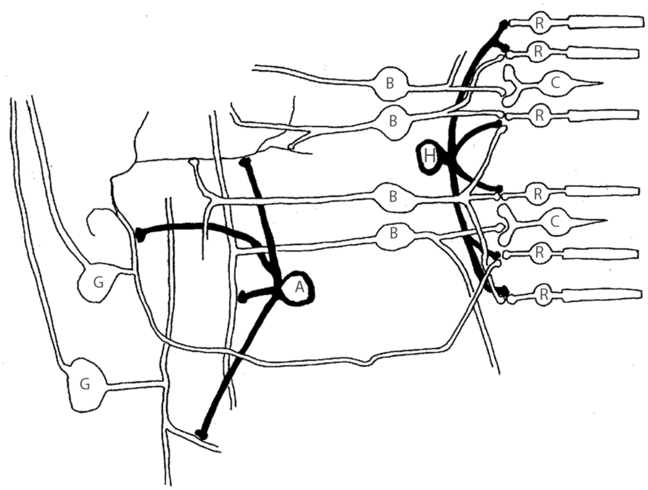

Figure 4 : The cell types that make up the layers of the retina are: ***rod receptors*** *(R),* ***cone receptors*** *(C),* ***horizontal cells*** *(H),* ***bipolar cells*** *(B),* ***amacrine cells*** *(A) and* ***ganglion cells*** *(G). Their purpose is to receive and organise patterns of information before sending them up to* ***visual area 1****.*

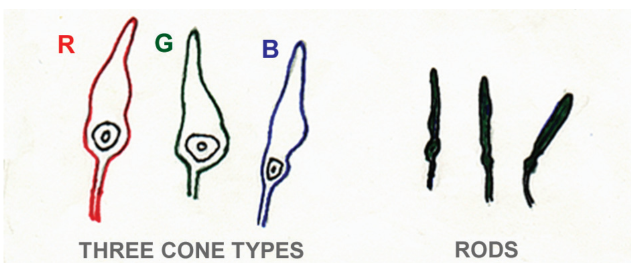

Figure 5 : The three types of ***cone receptor*** *are sensitive to all wavelengths of light, but each is relatively more sensitive in different parts of the spectrum. One is more sensitive to relatively long wavelengths (R), another to intermediate wavelengths (G) and the third to relatively shorter wavelengths (B). The* ***rods*** *are also sensitive to all wavelengths but are most sensitive to wavelengths between the peak sensitivities of the G and the B receptors. The rods are significantly more sensitive to light than the cones.*

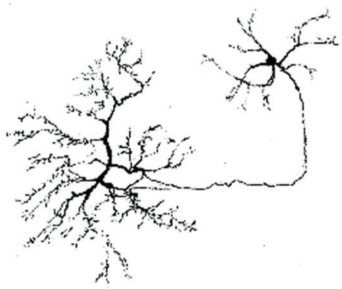

Figure 6: This copy of a drawing by Santiago Ramón y Cajal the pioneering neuroscientist provides a rough idea of the complexity and potential for connectivity of a ***ganglion cell****. His drawings of this and other cell types made clear that widespread interconnectivity is a fundamental property of neural processing.*

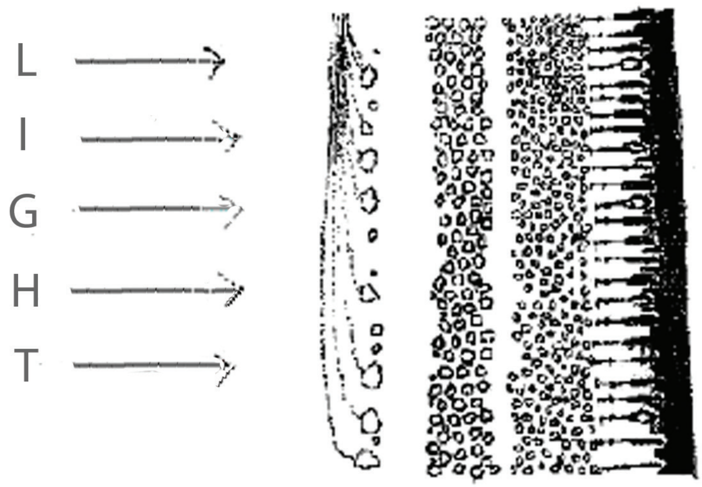

Figure 7 shows light entering periphery of the retina and traversing several layers of cells before arriving at the ***receptors****, which are facing towards the back. The only part of the retina where these light impeding layers are absent in the* ***fovea****.*

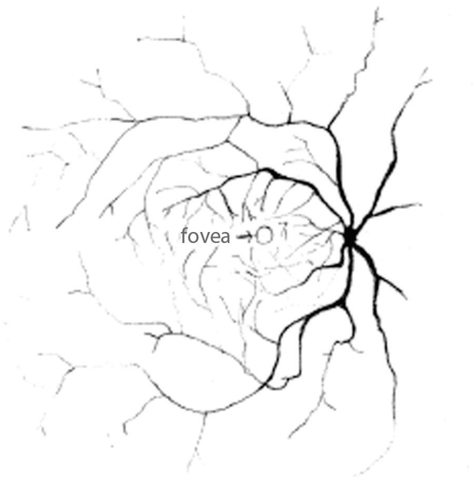

*Figure 8 : illustrates **blood vessels** between the lens and the **retina** that impede light everywhere except for a small region in front of the **fovea**. In this, the layers of light inhibiting cells represented in Figure 7 are absent.*

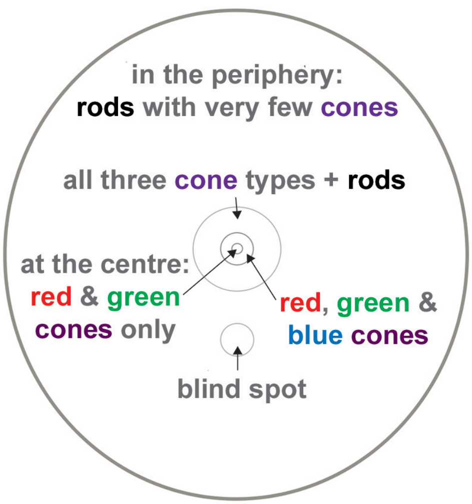

*Figure 9 diagrams the distribution of **rods** and **cones** across the **retina**. Only where the **incoming daylight** is not impeded by intervening **cell layers** (Figure 7) or **blood vessels** (Figure 8) is it strong enough to activate the **cones**. In contrast, it is only where it is impeded by them that the **rods** are not **bleached out** by its intensity. This is why there are no **rod receptors** in the centre of the **fovea**.*

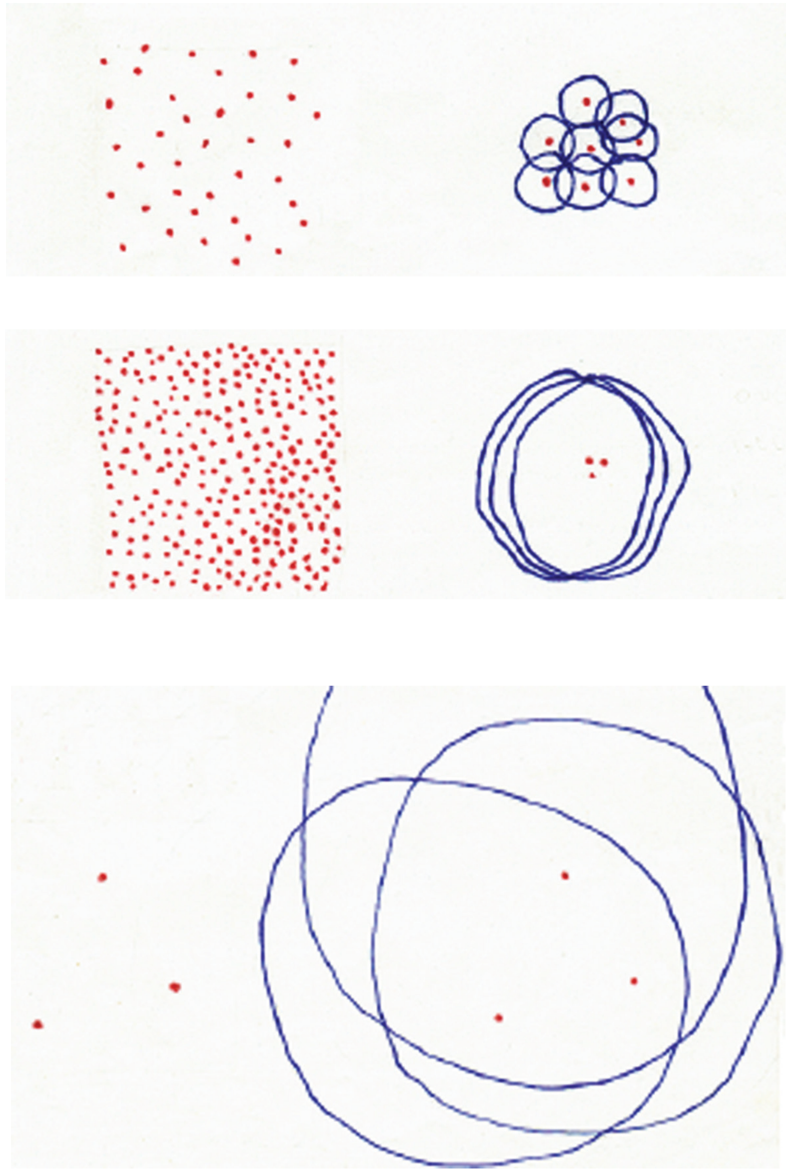

Figure 10 shows a mapping of ***amacrine cells*** *(see Figure 4) that indicates the density of distribution and the size of receptive fields. Three types of them are shown: (a) fairly densely distributed* ***small sized receptive fields*** *(top image); (b) much more densely distributed* ***medium sized receptive fields*** *(middle image); and (c) widely dispersed* ***large sized receptive fields*** *(bottom image).*

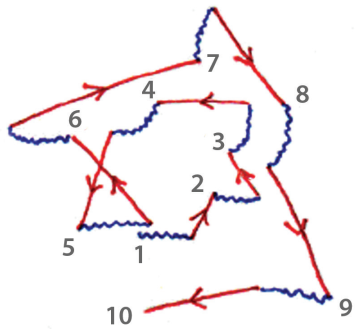

*Figure 11 shows a record of typical eye movements in which slow moving **glides** are interspersed with faster moving **saccades**. The glides provide a constant stream of **same/different information**, while the saccades enable an intermittent averaging of input that is useful for neural computations that require knowledge of the composition of ambient illumination.*