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BOOK REVIEW

A Vision of the Brain. S. Zeki, Blackwell Scientific Publications, Oxford, 1993, 366 pp.

> "When confronted by a difficult problem which goes against their way of thinking, scientists often begin by shutting their eyes firmly to the evidence and pretending that it does not exist. The next stage consists of accepting the evidence but pretending that it is not important or that it can be adequately explained by the known facts. The third and final stage consists of admitting the evidence and its significance but pretending that it has all been said before."

Zeki's book is full of this familiar succession. He begins with the Young–Helmholtz Trichromatic Theory, that any given coloured light can be matched by mixing three other lights of different colour. Helmholtz believed that colour was a property of an object, like size and shape, representing the wavelengths of light reflected from its surface. Although revolutionizing understanding of colour vision in the early part of this century, Helmholtz seems to have been aware that the theory could not account for the sensation of colour. Colours change little when viewed by different illuminant wavelengths, so colour perception does not rely merely on the wavelength of the light impinging on the retina.

Before Louis Verrey's clinical and pathological description of a patient with hemiachromatopsia in 1888 the notion of a region of the brain specialized for colour perception had been suggested several times. However, the evidence was almost universally discounted until the 1970s, the preferred notion being that the striate cortex was responsible for reception and analysis of all visual impressions, and the function of the more anterior regions of "association cortex" led to "understanding".

Zeki describes how the advent of functional imaging and single cell recording in the brain has challenged such ideas. Still the interpretation of the response characteristics of single cells in the cerebral cortex continues to evolve. Hubel and Wiesel discovered the ocular dominance columns in V1 which respond to lines of slightly different orientation with a precise correspondence between position within the visual field and anatomical localization within V1. They proposed a hierarchical model whereby the output of "simple cells" of V1 converge on "complex cells" whose response combines features of several "single cells". "Complex cells" in turn converge on "hypercomplex cells", often found in the "visual association cortex". Yet careful studies have now demonstrated motion- and wavelength-selective cells within V1, and the hierarchical model now looks inadequate.

The book amounts virtually to a history of the scientific thought on the functions of the cerebral cortex, and particularly on visual perception. Zeki leads us through the anatomy and physiology of visual perception, dreaming, hallucinosis, disorders of vision and consciousness to a resolution of the paradox of the generation of an integrated visual image from perceptions generated in functionally specialized brain regions. Along the way the argument gets lost in a chapter on plasticity of the brain which employs some dubious arguments on emotional deprivation and feral humans. At other times there is tiresome reiteration, which detracts from the readability of the text as a whole although I suppose may help those who wish to browse a chapter at a time. One may question who will read such a book, whose chapters individually seem to be aimed anywhere between the general public and the specialist postgraduate neurophysiologist. However, it is ungracious to quibble when a work contains so much to fascinate. Zeki's insights are challenging and contentious, and will provide a fertile source of ideas for the next generation of physiologists.

Reviewer R. A. Grünewald