Gunning for reductionism

Colin Blakemore

The Purposive Brain. By Ragnar Granit. Pp. 244. (MIT Press: Cambridge, Massachusetts and London, 1977.) $12.50; £8.75.

In this short book Ragnar Granit brings together two subjects on which he himself has worked—the visual system and the motor system—as the basis of a general monograph about brain function and as the vehicle to express an individual philosophy. His treatment of these two areas is business-like and straightforward, though even here his style is idiosyncratic and his personal opinions are clearly expressed.

In his treatment of vision Granit introduces both the concept of "feature-extraction" by neurones that are highly selective for certain "trigger features" in the retinal image, and a seemingly contrary hypothesis that cells in the visual cortex are tuned to different spatial frequency components in the complex distribution of retinal illumination, and thus may be involved in some sort of primitive Fourier analysis of the spatial pattern of light on the retina. Though he declares that the detection of "change, contours, and movement" (classical trigger features) is an essential part of visual analysis, he is, nevertheless, enthusiastic about the parsimony of the spatial frequency hypothesis and emerges on the side of the frequency freaks rather than the feature creatures.

The section on the motor system starts with the mechanism of the synapse, the function of reflexes and the role of muscle spindles in the control of muscle length. It continues with the hierarchical central control of movement, from the integrative function of the spinal motoneurone up to the topographical distribution and properties of upper motoneurones in the motor cortex, and the possible function of regions of the parietal lobe in the building of body image and in the operation of voluntary movement within external space.

All this is tackled with authority and vigour, and with a vitality that anyone who has had the pleasure of meeting Granit will instantly recognise. Ragnar Granit already has his place in the history of brain research. He was awarded the Nobel Prize in 1967 (together with Hartline and Wald) for his work on the retina; but, as Sir John Eccles noted at the time, he could equally have won it for his pioneering study of motor control. He has a special place in the hearts of neurophysiologists because it was Granit and Svaetichin who, in the late 1930s, developed the techniques for recording from nerve cells with an extracellular microelectrode: this step alone was revolutionary.

In the first five chapters, and in the last one, Granit expounds a personal philosophy of science: I suspect that his book will be read mainly for this, rather than for the more straightforward sections on brain function. Granit is gunning for reductionism and is not ashamed to call himself a teleologist. Physiology, he says, is "applied teleology", and the teleological approach is especially valuable in brain research to predict whether the purpose of any particular piece of brain machinery "would either be well or badly realised by one or several of a number of alternative hypotheses or models". Purpose, as the title of the book implies, is the central theme of Granit's discussion of the scientific method, the nature of understanding and, especially, the mechanism of evolution.

The brain is undeniably a purposeful machine, and the more advanced the species the more complex (even devious in the case of man) the purpose that its brain can pursue. But the richness of purpose in animal behaviour leads Granit actually to doubt the adequacy of genetic theory to account for the evolutionary emergence of purposiveness. He writes: "I am resigned to an attitude of mild scepticism as to the completeness of its coverage of matters requiring explanations". Consciousness is viewed as an "emergent novelty", the pinnacle of a hierarchy of purposiveness. Consciousness is said to be "the perfect instrument for realising adaptability" (but is there really a dependent relationship here: would a highly adaptable animal have to be conscious?).

Granit's "scepticism" about simple evolutionary ideas leads him to the brink of a belief that may lose him some of his readers. If natural behaviour is so full of purpose, he says, natural selection must have purpose too. He declares himself quite satisfied with applying the term "purposiveness" to evolution itself. But here his logic is not transparent: undeniable adaptation of each animal to its environment is surely not evidence for some kind of grand design in the mechanism for the emergence of species. To be sure, there is a frustrating credibility gap between the elegant examples of selection of simple characteristics and the monumental complexity of the human brain; but most biologists cling to the unifying hypothesis of "chance and necessity" and are unwilling to admit that it cannot cope with the mystery of mind. Granit surely gives a clue to this apparently intractable problem when he points out that adaptability (a kind of freedom from the constraints of innately coded instructions), not adaptation to a single environment, is "the glorious climax of evolution". The richness of human behaviour is essentially epigenetic: what we have our genes to thank for is the generalised capacity to seek purpose in our actions, not the impossible feat of specifying everything we can do. □

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Philosophy of ignorance

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The Encyclopaedia of Ignorance. Vol. 2: Life Sciences and Earth Sciences. Edited by Ronald Duncan and Miranda Weston-Smith. Pp. 433. (Pergamon: Oxford, 1977.) Paperback £3.50. Hardback combined edition with Vol. 1 on the Physical Sciences £10.

If, as the Philosophy of Induction invites us to believe, the sciences begin as great heaps of factual information which are "processed" according to a programme of ratiocination known as "the scientific method", then it is difficult to see why we should ever be ignorant of anything that we want to know or understand; if the inductive scheme were true, there could be only two reasons for our being so: either (a) our senses are so obfuscated by prejudice or sin that we cannot observe Nature aright; or (b) we are not performing "the scientific method" correctly. Possibility (a) was taken very seriously by the founding fathers of modern science, many of whom, doctrinary Puritans, believed that after the Fall, human beings lost the innocent perceptiveness that made it possible for them to recognise the Truth that Nature was simply waiting to divulge to those who would observe her intently and without preconceived ideas. Certainly this was John Milton's view, for whom the purpose of learning was "To repair the ruins of our first parents". Possibility (b) would carry some weight if the avowal of ignorance were a confession of failure by scientists whose past inability to make head or tail of Nature was already evidence enough that they did not really know or understand the scientific method—an explanation clearly falsified by the fact that the scientists who are most conscious of their imperfections and of the boundaries of their present understanding are often the most brilliant and empirically the most successful. Many of the authors of this symposium are