

Totally out of the question

Stuart Sutherland

No Way: The Nature of the Impossible. Edited by Philip J. Davis and David Park. W.H. Freeman: 1987. Pp.325. \$17.95, £17.95.

RUDYARD Kipling wrote:

I'm the Prophet of the Utterly Absurd,
Of the Patently Impossible and Vain.

The banjo's boast could be the theme song of creative scientists, who frequently make what seems impossible one day possible the next. Once upon a time it seemed impossible that the Universe was not eternal, that the Earth went round the Sun, that there was a finite velocity beyond which nothing could travel and that there could be a geometry that did not make the assumption that parallel lines never meet. Had there been anyone around to survey the Big Bang, he would surely have thought it quite impossible that one of its distant products would be mankind.

Professors Davis and Park have gathered together contributed chapters on 18 different subjects, ranging from chemistry to music and from biology to law. Each chapter sets out some of the impossibilities within the discipline it covers. The contributors for the most part write aimably and clearly. They often provide fascinating glimpses of their own subjects, though they rarely illuminate the nature of the impossible.

It might have been helpful if the editors had distinguished more carefully between different kinds of impossibility. Within science, what is thought to be impossible becomes possible if the theoretical framework is changed. Physics successfully absorbed the fact that matter can be converted into energy. But — a point hardly noticed in the book — there are different degrees of impossibility. Suppose, for example, foreseeing the future through clairvoyance were found to be possible. The business of bookmakers and of allied professions such as stockbroking would be severely damaged, but of more importance physics would find it impossible to absorb the finding for it runs counter to one of its most far-reaching assumptions. The finding could not just be explained by developing a broader theory in the way newtonian physics falls out as a special case of relativity theory; it would either require a complete rethinking of the whole of physics or — more likely — would have to be quietly ignored.

Apart from the impossibility of breaking the existing rules of a science, there are technological impossibilities which depend either on theoretical limits or on

the limitations of practical techniques. For theoretical reasons, based on heat loss, a petrol engine cannot convert more than about two thirds of the energy in the petrol into mechanical energy to propel a car, but for practical reasons the efficiency of existing engines is very much lower than this. Similarly the switching times of gates on a computer are limited by thermal fluctuations which create errors, but the present rate at which operations can be performed (about 10^7 per second) is well below the theoretically possible maximum. Yet even at a practical level the impossible often becomes possible. Although these topics are not mentioned in the book, it is not so long ago since heart transplants and blood dialysis would have been scoffed at. Surgeons are already at work to provide an artificial womb so that men can give birth, but even if the obscenity of some medicine makes it possible for a man to bear a baby one can feel fairly certain that babies will never bear men.

The impossibility of falsifying propositions that are true by definition (for example " $2 + 2 = 4$ ", or "nothing can be red and blue all over") is less interesting, except that even here the framework may change — as in the case of parallel lines never meeting — and life goes on.

One of the most interesting chapters examines how the law deals with impossible stipulations under a contract. In 1705 someone, who was clearly no mathematician, undertook to supply two grains of rye each Monday and to double the amount supplied on each successive

Monday for a year. He tried to escape the contract on the grounds that it was impossible to fulfil, but the judges took a different view. One announced "where a man will for a valuable consideration undertake to do an impossible thing, though it cannot be performed, yet he shall answer damages". The other more tersely pronounced "the defendant ought to pay something for his folly". Although the issue of impossible contracts has not been fully resolved, the law tends nowadays to take the sensible view that if someone knowingly commits himself to performing the impossible, he should be responsible for his promise, but if he has no reason to believe it to be impossible he may be absolved.

There is a devastating chapter on education that rightly notes that it is not a science and that not a single finding or theory in psychology is of any use to the practising educator. The chapter on psychology concentrates too heavily on a well worn theme — the impossibility of being a good parent. It might have been more interesting to discuss wider issues, such as the impossibility of finding happiness from within or the impossibility of deliberately changing oneself. But no book can discuss all impossibilities, which range from "you can't get an ought from an is" to "you can't get a man with a gun". Although *No Way* is not impossible to put down, it is impossible to resist dipping into it. □

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Against ignorance

Patricia Smith Churchland

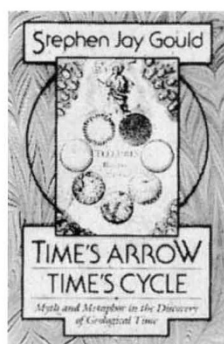
Philosophy and the Brain. By J. Z. Young. Oxford University Press: 1987. Pp.233. £12.95, \$22.50.

NEUROSCIENCE has progressed to the point where it has begun to impinge seriously and systematically upon our understanding of human nature. Although nothing like a full-scale theory has emerged, there are many entry-points where we can begin to make neurobiological sense of psychological states and processes: what it is to see, be awake or dreaming, feel pleasure and pain, and so forth.

Many philosophers have started to take on board the implications of recent developments in neuroscience, but there remains a diehard core for whom neuroscientific discoveries are irrelevant. Favouring the *a priori* approach to questions about what we are and how we work, they use the label 'scientism' for the view that neuroscience can provide enlightenment, even as — perhaps especially

as — it changes our intuitive conceptions of ourselves. By hitching the pejorative 'ism' to the end of an otherwise respectable word, they convey the suggestion that science is encroaching on the territory of the humanities, where, apparently, it has no legitimate business. To such people the very idea that behaviour might have a neurobiological explanation seems demeaning to human dignity and self-esteem.

In *Philosophy and the Brain*, J. Z. Young tries to convince the sceptics that if they allowed themselves to know what research has revealed in the neurosciences, they would recognize that the *a priori* approach is blinkered and stifling. They would see, too, that neurobiological explanations of human character and behaviour enhance rather than detract from the dignity of man, because they give us insight and understanding based on fact. Perplexed and dismayed by the policy of ignorance, Young has tried to assemble a sort of neuroscience-without-tears. By keeping the book short and minimizing technical language, he has tried to make it easy for philosophers to see why they should care about how the brain works. ►



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They should care, if only because neuroscience is directly relevant to Cartesian dualism (the claim that the mind is a separate substance, distinct from the physical brain, in which inhere all our mental states and processes). Young's general approach here is straightforward: the empirical data make dualism highly implausible. Once we see the systematic connections and dependencies between states described at the psychological level and states described at the neurobiological level, dualism looks about as tenable as vitalism. Young follows this up with the claim that dualistic implications are sometimes built into our psychological concepts, for example 'the self' and 'free will', and when they are, he avers, we ought to divest ourselves of the misleading implications.

Having argued for the basic thesis that mental states are states of the physical brain, Young proceeds to draw upon research in the neurosciences to display vignettes of what has been learned about the specific neurobiological basis of mental states and processes. Echoing themes from his earlier work, *Programs of the Brain* (Oxford University Press, 1978), he takes as an organizing principle the idea that nervous systems are fundamentally geared to enable the organism to act: principally, to feed, flee, fight and reproduce. The brain, as he puts it, has 'programs' for behaviour, and even something as ostensibly passive as vision should be seen in the context of action, as the search for information. Young takes this as the key to understanding knowledge in general: "my thesis is that human knowledge can be considered as a special development of the process of gathering information for life that is essential in all organisms" (p.79).

From this perspective, Young touches on a variety of results from physiology (such as the topographic and columnar organization of sensory cortex) and from psychology (visual hyperacuity and the ability of infants to respond differentially to all known phonemes). Along with many linguists, he takes the research on infant phoneme recognition as support for nativism for language. One problem with this conclusion is the finding that the chinchilla, of all unlikely animals, can, like the human infant, respond differentially to all the same phonemes. Consequently, whatever the innate substrate for this capacity, it does not appear to be unique to language users.

The book readily acknowledges that neuroscientists possess only pieces of the puzzle of how brains represent and process information. What we need to know is how networks of neurons interact to produce certain effects, but, as things stand, we don't have the physiological techniques for investigating properties at the level of the circuit or the system.

Modelling is, therefore, an important means of developing hypotheses at these higher levels. Young discusses Marr's approach to modelling, though he says very little about the connectionist approaches that have superseded Marr. What he does say is curiously unenthusiastic, perhaps because the new learning algorithms (Boltzmann machine and back-propagation) had not been formulated when he was writing the book.

In rounding out the general 'physicalist' picture, Young anticipates the time when we will have neurobiological explanations for sensory and cognitive processes, and also for human ethical behaviour and aesthetic preferences. Unafraid to grasp the nettle, he believes that as neuroscience proceeds and we understand more accurately the springs and principles of human behaviour, we may improve our ethical attitudes towards responsibility and blame. His argument rests on the thesis that insofar as cultural and social factors affect ethical behaviour, they must be represented in the brain, and such representation will eventually be within the compass of neuroscience. This is not so much an argument as a reaffirmation of 'physicalism', and Young tends to underestimate the difficulty of arriving at neuroscientific explanations of moral behaviour.

Although the aim of the book is admirable, there are weaknesses in execution, principally because Young skims very fast over both the philosophy and the neuroscience. On the philosophical side, he probably does not know the opposition as well as he might and regularly leaves himself open to accusations of naivety. On the neuroscientific side, most of the discussions are insufficiently developed to convey a genuine understanding of the research concerned. A further drawback to the book for the neuroscientifically innocent is that there are no illustrations — how can even the most diligent philosopher master the significance of hippocampal architecture or the widespread projection system of the locus coeruleus if he cannot see what it looks like?

Nevertheless, *Philosophy and the Brain* is the work of a man who has thought long and deeply about the neurobiological basis for psychological processes, and it gives an important view of the need to integrate philosophy and neuroscience. Young's insights into matters where empirical results bear upon philosophical opinion should at least move philosophers to wonder whether devotion to the *a priori* strategy has not been profoundly misguided. □

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