

Angles on knowledge

David Miller

The Limits of Science.

By Nicholas Rescher.

University of California Press: 1985.
Pp.225. \$34.50, £31.50.

THE question of whether there are any limits to empirical science is one that, since Kant anyway, has never been far from the centre of the theory of human knowledge. Logical positivists persuaded themselves (and others) that meaningful investigation is restricted to the results of observation, experiment and induction. Less extreme sufferers from scientism have held that there is no knowledge but scientific knowledge. On the other side it has been suggested that the traditionally conceived method of science as one of "rational triangulation from the empirical data" (as Rescher describes it on p.198) sets more of an external limit to science than an internal one.

In this work, much of which is collated from his innumerable previous books, Rescher approaches the issue from a number of angles: whether there are topics wholly beyond the mandate of science ("no" in Chapter 7, "yes" in Chapter 12); whether science could be perfected, even in principle ("no" in Chapter 9); whether there are problems within its domain that science is in principle unable to answer ("no" in Chapters 4 and 8); whether there are significant questions that for practical (technological) reasons science cannot handle ("yes" in Chapter 10); whether science progresses steadily towards theoretical perfection ("no" in Chapter 5); whether it progresses at an instrumental level ("yes" in Chapter 6); whether extra-terrestrial science might be scientifically more advanced than ours (question dismissed in Chapter 11).

The discussion throughout is thoroughly unsatisfactory: superficial, confused, philosophically unsophisticated, repetitive, neologistic, above all deeply antipathetic to theoretical speculation. For example, in the account in Chapter 11 of how our science and alien science might be related, a discussion whose only real conclusion is that there is nothing of interest to say, we read:

A tiny creature living its brief life span within a maple leaf could never recognize that such leaves are deciduous. ... Science is limited to the confines of discernibility: as Kant maintained, the limits of our experience set limits to our science [p.197].

So much for the power of ideas. Yet in Chapter 8 Rescher seems properly to appreciate that science is not confined to what we can experience but a method of going

● P.B. Medawar's *The Limits of Science*, first published in the United States by Harper & Row, and recently in Britain by Oxford University Press, was reviewed in *Nature* 312, 203 (1984).

wildly beyond it. In a similarly glum mood Rescher seems to suppose that because other planets might be physically very different from ours, scientists there might use mathematics... very unlike ours... their 'geometry' could be something rather strange, largely topological, say, and geared to flexible structures rather than fixed sizes or shapes [p.177].

Just like some of our mathematics by the sound of it.

Can current science tell us anything about future science, about extraterrestrial science, about possible limits to scientific inquiry? The answer seems obviously that it might be able to, but that what it tells us might be wrong. Rescher persistently muddies this issue, gliding from the platitude that "no adequate justification can be found for the view that science has barriers" (p.130) to the assertion that it has no barriers. He seems not to have appreciated that if "present science cannot speak for future science..., [if] there can be no basis for claims of inherent unanswerability" (p.129), then present science cannot speak for present science either, and there can be no basis for its assertions about the natural world. Yet Rescher is unwavering in his belief that the results of science can be justified. We are told that the advance of science amounts to obtaining "a firmer warrant for our claims", not "more of the truth"; and we are warned of the "fallacy... that moves from a picture-of-

nature's being a *better-warranted picture* to its being a *better picture*" (pp.73-74). Only someone who confuses justification with truth, and thinks that all moves have to be justified, could see this move as a fallacy rather than as an attempt to discover the truth.

The question of the existence of insolubilia is itself eventually resolved in Chapter 8 as follows:

How could we possibly establish that a question *Q* will continue to be *raisable and unanswerable* in every future state of science...? ... [If we] argue that the answer to *Q* lies 'in principle' beyond the reach of science, ... it is difficult to see how we could maintain it to be an authentic scientific question [p.128].

In other words, science has no limits except where it has limits.

Most of the topics treated in this book are treated more than once, as though the different chapters had originated from different authors. The writing is always verbose, and horrible hyphenated words ("issue-killer" on p.17, "question-disallowing" on p.22, "hole-internal" on p.131, for example) abound. On p.52 the same 130-word quotation appears twice: in the text and in a footnote appended to it. The word-processor has a good deal to answer for. In most other respects the book is well produced. □

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Word and number meta-magic

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Metamagical Themas: Questing for the Essence of Mind and Pattern.

By Douglas R. Hofstadter.

Basic Books: 1985. Pp.852. \$24.95. To be published in Britain later this year by Viking.

DOUGLAS Hofstadter is widely and justly celebrated for his book *Gödel, Escher, Bach*, and for his co-production with Daniel Dennett of *The Mind's I*. Between June 1981 and September 1983 he succeeded Martin Gardner in running *Scientific American's* "Mathematical Games" department. He gave his contributions the anagrammatical title of "Metamagical Themas". All 26 of these essays are reprinted in this book. Each now has a postscript of subsequent reflections and developments; in addition there are seven new, specially-written "Themas".

Hofstadter claims that his Themas form a scatter of random dots around his intellectual "home territory", which is concerned largely with thinking, thinking about thinking, and thinking about language. There are Themas on self-referring and self-replicating sentences, and

ones on the search for consistent patterns and styles in music and in geometrical art-forms. Hofstadter's own research into artificial-intelligence programming is reflected in several Themas, such as those on the pattern-recognition of sameness underlying difference, in particular the recognizable sameness of letters of the alphabet throughout unimaginably many variations of form and fount.

Other Themas continue the tradition of "Mathematical Games", dealing with such topics as Rubik's cube, the mathematics of chaos, computer languages, psychological games with numbers, and logical dilemmas and paradoxes. A rather special cluster of Themas locates a societal region in Hofstadter's territory: his concern over mass gullibility, innumeracy and some political issues. Each Thema is complete in its own right, but most are buttressed and extended by others elsewhere in the book. It's a format ideal for browsing; rather like his previous books, in fact. There is an excellent bibliography, with short notes on the works cited.

To illustrate Hofstadter's style and matter, I'll outline one Thema in greater detail, No.23 "On the Seeming Paradox of Mechanizing Creativity". Could a computer be creative in the human sense? Or must it always be, in effect, a huge fast-scanned dictionary of clichés? After considering the background to this question, Hofstadter introduces an example of