virtue of human activity. *Really* real objects, on the other hand, exist in the ID. This sphere contains the genuine causal laws, generative mechanisms, structures, processes, relations, forces and fields of nature that exist independently of human activity.

Bhaskar's view of the cognitive situation in the sciences has, then, something to please both sociological/epistemological relativists and philosophical/ontological realists. However, the way that Bhaskar characterises the dependency of each position on the other may please neither the relativist nor the realist. For example, Bhaskar argues that unless the ontological realist recognises the actuality of epistemic relativity in the TD s/he will end up conflating constant conjunctions with actual causal laws and thus reify and fetishise the products of human labour. (One might ask, however, whether this is the only way that the realist can oppose epistemic relativity.) Similarly, Bhaskar argues, unless the epistemological relativist recognises the ontological realism of the ID s/he will think of genuine causal laws as simply the product of human labour and thus open the way towards 'voluntaristic superidealism'.

The real problem for Bhaskar's attempt to find some sort of peaceful coexistence between relativity and realism comes, however, when we try to ascertain what relationships are meant to hold between the scientific ontologies in the TD and the *really* real ontology of the ID. Bhaskar's solution to the problem of this relationship is to claim that truth operates "bivocally" (p.100). Truth is bivocal in the sense that it designates a certain type of statement, and, at the same time, reaches out and links a statement in the TD with a piece of intransient Being in the ID. We are thus left with the fairly commonplace idea that while the test of truth can only be made by using our own socially constructed standards, the nature of truth is its reference to some ready-made world of intransient objects and processes. Hence Bhaskar's account of the relationship between the TD and the ID faces the problem of specifying the precise nature of this reference. Bhaskar's trancendental realism has nothing to say on this topic.

In his second chapter,[2] Bhaskar defines false consciousness in the natural and the social sciences as a lack of correspondence between belief and object (p.178). But since, as we have noted, an account is not provided of just what this correspondence or reference between belief and object is, Bhaskar's concept of false consciousness becomes quite vague and the idea of emancipatory practice as elimination of false consciousness rather opaque.

The opacity of Bhaskar's central concepts is compounded by the style in which the book is written: it is exceedingly complex and often abstract to the point of incomprehensibility, even when the ideas expressed are very traditional. This is a pity because in the last chapter of the book (an analysis of Positivism as a philosophical ideology) Bhaskar shows that he does have something to say that is interesting, important and (almost) comprehensible.

JEFFREY BROWN

Notes

1. For an earlier defense of this position see Bhaskar, *A Realist Theory of Science* (Leeds: Leeds Books, 1975; 2nd ed., Brighton: Harvester, 1978).
2. This chapter draws upon Bhaskar, *The Possibility of Naturalism* (Brighton: Harvester, 1979).

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I. Niiniluoto, *Truthlikeness.* [Synthese Library, no. 185] Dordrecht/Boston/Lancaster/Tokyo: D. Reidel, 1987. £73.50.

The question "In what sense does science progress?" is one of the most central in modern philosophy of science. A number of philosophers, notably Popper, have suggested that the answer is to be found in the notion of verisimilitude, or approximation to the truth. In this book Niiniluoto summarises, extends and defends his account of verisimilitude published in numerous papers over the last ten years. On the way, he fights a running battle with Oddie and Tichy, whose approach to verisimilitude is similar, and with Miller, who is against the whole enterprise. There is some philosophical discussion, but the book is largely a technical one; and although a couple of its chapters are spent developing the necessary formal prerequisites, it makes few concessions to the technically unsophisticated. Moreover, like most books in the logical empiricist tradition, it does not attempt to apply the theory developed to real live historical theories.

Niiniluoto's approach to verisimilitude is in terms of distance-metrics on various classes of entities. Given a language L, with interpretation I, its cognitive goal G is defined to be the set of sentences in L true in I. Let T be a theory in L. The distance of T from the goal is defined (p. 368) as a weighted average of (1) its distance from the truth and (2) its toleration of falsity. This definition does seem to face a technical problem, since the second of these notions involves a summation over a domain of continuum cardinality. Niiniluoto suggests (pp. 215-6) that in such cases the sum should be construed as an integral; but the value of such an integral, if it has one at all, depends on a prior mapping of the domain into the reals, and it is difficult to see how such a mapping could be defined in any but an arbitrary way.

The definition of the distance function itself is complex and draws (ironically enough in the view of the Popperian origins of the notion of verisimilitude) on the resources of Carnap/Hintikka inductive logic. The definition is highly syntactic and is thus open to a well known objection, due to Miller, against any such definition, which shows that verisimilitude is not invariant under translation between equivalent sentences of different languages (L_1 and L_2, say). Niiniluoto points out (p. 451 ff) that considered as sentences of the language which is the union of L_1 and L_2 ($L_1 + L_2$) the sentences do have the same degree of verisimilitude. This is not so much a reply, however, as a way of underlining the weakness of this notion. For one would not expect the degree of verisimilitude of a sentence to depend on the existence of completely extraneous predicates in the language (such as those of $L_1 + L_2$ not occuring in the sentence). Niiniluoto suggests (p. 449) that is it reasonable to suppose that the target at which our theories aim (and hence their verisimilitude) may change as our concepts are enriched. Be that as it may, $L_1 + L_2$ is not a conceptual enrichment of L_1 but a trivial linguistic one. For any sentence of the language $L_1 + L_2$ in the Miller examples is logically equivalent (modulo the meaning postulates) to one of L_1 (and similarly for L_2).

The language-relativity of the degree of verisimilitude also means that this notion

of verisimilitude cannot provide a general solution to the problem of the sense in which science progresses. For progress in science must now be considered as constituted not only by improving verisimilitude relative to a language, but also by improving the language. As Niiniluoto puts it (p. 463 f): "scientific progress involves not only theory-change within the boundaries of a given conceptual scheme, but also the development of new, more powerful, frameworks that allow us to penetrate deeper into reality and to formulate theories with a great unifying power". Hence, if Niiniluoto's account of verisimilitude is right, an account of progress in language needs to be given (it is obviously not cumulative), and its interaction with verisimilitude charted.

Although I have been critical of Niiniluoto's account of verisimilitude, this is possible only because the book provides a meticulous, clear and thorough analysis. Indeed, it (together with its sister book, Graham Oddie's *Likeness to Truth*) provides the most carefully worked out technical account of verisimilitude to date. Study of its contents will well repay anyone interested in the subject who can handle the formalities.

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Geert M.N. Verschuuren, *Investigating the Life Sciences: An Introduction to the Philosophy of Science*. Oxford: Pergamon Press, 1986. A$73.00.

This is a peculiar little (146 pp.) book that develops an interesting and potentially fruitful approach to the philosophy of science, inspired by the later Wittgenstein and leavened by elements of Kuhn, Feyerabend, Chalmers, Foucault and Habermas. It embarks on this project under the pretext of dealing thereby "with research in the life sciences (biology, medicine, pharmacy, agriculture, etc.)" (p. vii). In practice, however, the book touches only tangentially, and in a somewhat contrived way, upon the specific problems of the life sciences, and it certainly never deals with particular applications such as medicine, pharmacy or agriculture.

What the book does do is to present a philosophical account of science which potentially integrates both its objective and subjective aspects in a coherent, if controversial, way. The life sciences are injected rather artificially into the discussion by means of a series of "case studies" comprising Part II of the book. Here aspects of the work of William Harvey, Claude Bernard, Gregor Mendel, Charles Darwin and George Gaylord Simpson are briefly and superficially canvassed. The historical material in these discussions is often unreliable (e.g., p. 37, where it is claimed that Vesalius "did not dare to counter Galen"), and Part II as a whole does not contribute in any useful way to the rest of the book. One gets the impression that this section is either 'padding' to increase the total length of the text or else an unsuccessful attempt to orient a general book on the philosophy of science toward the particular 'market niche' of the philosophy of biology.

Parts I, III and IV present, as already suggested, some valuable and provocative material; and Part III does take up the question, among others, of explanation in the

life sciences – without, however, making any reference to Part II in so doing. I would recommend that prospective readers abandon any expectation of a special biological focus in this book, and that they read Parts I, III and IV only. They will find some difficulty in the peculiarities of Verschuuren's English usage, including some presumably unintended comic effects (e.g., p. 30, where he refers to Descartes' desire for a "waterproof" system, rather than a watertight one), but responsibility for these lapses must lie more with Pergamon's editors than with Verschuuren, whose native language would appear to be Dutch.

Despite infelicities of expression, however, Verschuuren's book represents a significant attempt to construct an understanding of science which transcends the dualism of facts and values. As such it deserves a wider audience than it is likely to attract under its present misleading title.

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