

REVIEW

Graham Priest, Richard Routley and Jean Norman (eds.), *Paraconsistent Logic. Essays on the Inconsistent*. München: Philosophia Verlag, 1989.

It is generally acknowledged that for any branch of science, including mathematics and logic, to reach maturity, it is necessary (though not sufficient) that there exists at least one basic reference book (or Book). For the field of mathematical logic up to the 30s, one has Van Heijenoort; for modal logic, one has Hughes & Cresswell; for relevant logic, one has Anderson & Belnap; and, finally, for paraconsistent logic, one now has Priest, Routley & Norman. The book has been announced a number of times, but, at last, the Great Gap (as I prefer to call it) in the four-volume *Handbook of Philosophical Logic* has been bridged.

As it is quite impossible for any reviewer to deal extensively with a book over more than seven hundred pages long, I will do what most reviewers do: present the reader with a brief overview of the contents and select some of my own favourite topics. The result is inevitably a rather idiosyncratic presentation. On the other hand, I can think of no better way to illustrate the importance of a topic than to show how it is relevant to my your domain of research.

The book is divided in four parts: *The History of Paraconsistent Logic*, *Systems of Paraconsistent Logic*, *Applications of Paraconsistent Logic*, and *The Philosophical Significance of Paraconsistency*.

I will be rather brief about the first part. It consists of four contributions. G. Priest and R. Routley present in their *First Historical Introduction: A Preliminary History of Paraconsistent and Dialethic Approaches* and in *An Outline of the History of (Logical) Dialectic* a rather lengthy, broadly conceived canvass of paraconsistent logic. A.I. Arruda in her *Aspects of the Historical Development of Paraconsistent Logic* continues the history into modern times with an excellent overview of whp's doing what paraconsistently in the world today. The last contribution - Priest's *Classical Logic aufgehoben* - sketches a really nice picture of the development of formal classical logic. In less than twenty pages, Priest makes clear what went wrong with the classical program and why paraconsistency is (urgently) needed.

The second part forms the core of the book. All of the known paraconsistent and dialectical logical systems are presented here: *Systems of Paraconsistent Logic* (G. Priest and R. Routley), *Dynamic Dialectical Logics* (D. Batens), *Paraconsistent and Com-*

binatory Logic (M. W. Bunder), *Problems of Modal and Discussive Logics* (J. Kotas and N. C. da Costa), *Abelian Logic (from A to Z)* (R. K. Meyer and J. K. Slaney), *Paraconsistency and C_1* (C. Mortensen), *On Detonating* (P. K. Schotch and R. E. Jennings), and *Consistency, Completeness and Negation* (D. Vakarelov). Rather than discuss any of these papers in detail, let me just mention some important characteristics. The basic idea of paraconsistency is to separate inconsistency from triviality, an impossibility in classical logic because of the *ex falso* (from p and not- p , q is derivable). Therefore, what all these authors propose, is an alternative to classical logic.

The first question must be: does such an alternative exist? The answer here is a strongly emphasized yes; in fact, at some point the reader will have the impression that there are too many good things around. Some authors do stress the need for a general map of the paraconsistent domain. The second question is: are there *simple* alternatives among them? Here too, the answer is yes. Some of the proposed systems are very close to classical logic, some form a sequence with classical logic at one end and a strongly inconsistent logic at the other end, and some are translatable into known systems. In other words, one cannot reject the paraconsistent program because it is technically non-feasible. Quite the opposite. In Lakatosians terms, what we have here is a progressive program with plenty of positive heuristics.

Anyone familiar with foundational research in mathematics, set theory in particular, knows the drama of the naive comprehension axiom (NCA). The principle is so simple and straightforward that one is only willing to drop it if one is really forced to. In the face of paradoxes and inconsistencies that is what most logicians and mathematicians did and still do. But, comes along paraconsistent logic and one is no longer forced to drop it. Thus, NCA is back in business. But is it? NCA is simple, straightforward, indeed, but it is at the same time, amazingly strong. Analyzing Russell's paradox, but more importantly, Curry's paradox, it became clear that not any paraconsistent logic will do the job. If contraction is allowed as a rule - from "if A then, if A then B " derive "if A then B " - triviality follows.

The question to be answered first of all, is therefore: is there a non-trivial set theory with (a form of) NCA? In *The Non-Triviality of Extensional Dialectical Set Theory* (R.T. Brady and R. Routley) and *The Non-Triviality of Dialectical Set Theory* (R.T. Brady) it is shown that the answer is yes. An impressive result of high logical standard as the proofs are anything but easy and straightforward (strangely enough). But, the game is a

tricky one, as J.K. Slaney shows in his *RWX is not Curry Paraconsistent*. Change a rule somewhat, change an axiom somewhat, and triviality is inevitable, or, the next worse thing, one can show that everything is a member of everything. To have NCA is something like having the cake and eat it. But the moral at this point seems quite clear: only if you eat in a particular way. And, one may wonder what the gain is, if instead of a particular way it turns into a funny, almost Carrollian way. Thus F.G. Asenjo's *Toward an Antinomic Mathematics* really stretches the imagination. Two examples: (i) antinomic numbers are such that they are greater and smaller than every other number, including itself; (ii) an ordinary number has exactly one successor, whereas an antinomic number has exactly two. The White Queen managed to "believe as many as six impossible things before breakfast", but even this might prove to be hard on her.

Mathematics, however, is not the only field of application for paraconsistent logics. G. Priest and R. Routley in *Applications of Paraconsistent Logic* present a wide range of possibilities, most of them still to be investigated in full detail. Quantum mechanics is an obvious candidate, but epistemology (e.g., epistemic logic, logic of belief), computer science (e.g., belief revision, non-monotonic reasoning, inductive reasoning etc.), ethics (e.g. the problem of expressing "real" moral dilemmas in deontic logic) are but a few of the items on their list. In short, I already mentioned the obvious progressive character of this research program from the technical logical point of view, but the same holds from the applicational point of view. The problems with naive set theory notwithstanding.

Part four should really attract the philosopher's attention. G. Priest and R. Routley's *The Philosophical Significance and Inevitability of Paraconsistency* offers the reader a thorough defence of the paraconsistent view against "the ideology of consistency" to use their own phraseology. The other papers in this section deal with problems such as existence, identity and equality, and the notion of proof, to name but a few: *Wittgenstein and Paraconsistency* (L. Goldstein), *Verum et ens convertuntur* (L. Pena), *Reductio ad absurdum et modus tollendo ponens* (G. Priest), *Paraconsistent Logic: Some Philosophical Issues* (F. Miro Quesada), and *Moral Dilemmas and the Logic of Deontic Notions* (R. Routley and V. Plumwood).

Basically, what is philosophically attractive about paraconsistency is, on the one hand, to have a language in which contradictions can be expressed and, on the other hand, to avoid triviality as a consequence of accepting contradictions. The first element is important as this will be the kind of language we need

for describing such processes as theory change, belief revision, etc. If there is ever to be a logic of discovery, it is a safe bet to claim that it will be a paraconsistent logic of discovery. The second element is equally important as it promises to simplify our (philosophical) lives. Yes, you can have a Tarskian truth definition without a hierarchy of languages; no, you do not have to worry about the million different types in Russell-Whitehead set theory; no, you do not have to worry about Gödel anymore as his results depend crucially on consistency assumptions. There is more. Historically, the logicist's program was abandoned because of Frege's failure to deal with Russell's paradox. Assuming, of course, that the paradox had to be dealt with, a philosophical must for Frege. But, paraconsistently speaking, not evident at all. Why not accept the paradox and restore the logicist program (if one happens to be so inclined)?

It would be a miracle if within the next two years (decades?) the logico-philosophical community decided to replace classical logic by (a) paraconsistent logic. Fortunately, that is not what we have to wait for. If in an argument you claim: "Suppose, for argument's sake, that a contradiction is true ...", then surely your opponent will claim this is an impossibility. At least, now you can answer your opponent that (s)he is wrong. If you present a new idea and somebody proves your brilliant new idea inconsistent, this is not the end of the story. Rather, a new set of questions has to be dealt with. E.g., what type of contradiction is it? Does it need to be resolved? If the contradiction is accepted, what follows from it? Is it the only derivable contradiction? It is really difficult, if not impossible, to estimate what the consequences for philosophical practice are, once the "paradox = disaster" idea is weakened or abandoned.

Summarizing, what this book shows is that the paraconsistent research program is a well-developed undertaking on the technical level, on the applicational level, and, most important of all, on the philosophical level. In short, you can dislike the idea to accept inconsistencies, but you will have to argue for it. This book shows the kind of opponent you are likely to meet. And, apparently, they are well prepared to accept the challenge.

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