The book contains four sections. It starts with an introduction in which some 20 systems are briefly described. There is, however, no synthesis of the common approaches, nor an analysis of the differences. The descriptions are also rather shallow (about half a page each).

The core of the book is divided into three chapters in which papers are grouped according to the functions they perform. The first chapter, taking about half the pages of the book, describes systems which are—according to the chapter heading—related to "test strategy planning and test expertize". A majority of the contributions in this chapter describe systems which are utilized during the design phase of VLSI chips. More specifically, they deal with systems for the analysis of the testability of the design, as well as with proposing modifications in the design to make the final products testable.

Specifically, the 45 page long paper of Breuer et al. gives a good overview of their system as well as the various issues relevant during the design of testable VLSI chips. Also, the papers of Buonanno and Sciuto, Dislis et al. and Crastes de Paulet et al. present different approaches to the same problem. The advice such systems can give range from critiquing the proposed design up to proposals for modifications of the design. The last two contributions in this chapter are rather shallow and do not add much to the other papers.

The second chapter deals with "Knowledge-based diagnosis". The first paper in this chapter is titled "Survey of diagnosis expert systems". I would hardly consider this chapter as a survey. As a matter of fact, only two paradigms regarding knowledge representation for such systems are discussed: shallow knowledge and deep knowledge representation. Any survey of existing systems is lacking.

The next two papers in this chapter contain more relevant information. Malabocchia describes knowledge engineering issues in constraint-based diagnosis. This paper discusses some issues that are also relevant in domains other than electronics engineering. The paper of Kennett and Totton gives valuable insight in the process of building a diagnostic expert system. These two papers discuss applications at the level of diagnosis of failures of components on a printed circuit. The last paper describes a tool for building expert systems for technical diagnosis and maintenance. There is no report on experiences with the tool for building actual systems.

The last chapter deals with "Rule-based design verification and maintenance". The first paper by Bolsens et al. describes in a formal way a system for the verification of MOS digital circuits. It gives in a comprehensive one way overview of the verification strategy, the approach to partitioning the design in lower level blocks and some issues for finding errors in the design. In the end some results are reported from test runs with the system. The next paper describes a similar system, but in lesser detail than the previous paper. The last paper addresses the issue of developing maintenance programs. Robach et al. describe an approach for determining optimal test sequences such that all components of a printed circuit are tested, taking into account the time for execution of the test as well as the test complexity. This paper also is relevant for other domains.

In conclusion, the book describes a number of KBSs in the domain of design and testing of chips and printed circuits. Therefore, it is much narrower in scope than the title may suggest. Readers who are familiar with terms such as BIST, BILBO, TDM, PLA, ADFT, FSM—they all appear in the introduction—may find valuable information in this book. For others, only a few papers may have valuable information.

A final remark is that many of the papers are written in rather poor English. I think that the editors would have served their readers better if they had also paid attention to this aspect of the publication.

Neural network design and the complexity of learning by J Stephen Judd, The MIT Press, Cambridge, MA, 1990, pp 134, £22.50.

Neural networks as a computational paradigm are currently of wide interest, discussion of this model no longer restricted to mathematicians, computer scientists, psychologists, and the like, but now often read about in science sections of newspapers, and mentioned on technology-orientated television programmes. The interest that neural networks have generated might be attributed to a mixture of interesting facts and exaggerated claims. *Neural network design and the complexity of learning* puts a few of these claims in their place.

The common denominators in the profusion of neural network designs are neuron-like processing elements, each only able to perform some very simple function, and secondly the basis that all processing is done by a collection of these neuron-like elements connected together. The term "neural networks" then encompasses a very large number of ideas, architectures, theories and topologies. J Stephen Judd's book focuses upon an area of this science for which the name "neural networks" is readily associated. The type of networks looked at are unidirectional, feed-forward, deterministic ones. These are usually the types of network first encountered by those studying the subject, and are also the most commonly used and available commercially.

There is an interesting approach taken throughout the book of formulating a learning theory without reference to any particular architecture. Judd uses well known computational theories of complexity, namely whether a polynomial or non-polynomial time-solution exists to the problem of a neural network learning. To reach interesting results the family of feed forward networks is considered. Detail, however, of any particular learning method, topology, or neuron function is abstracted, and the consequent broad focus allows Judd to make a very interesting investigation into the computational difficulties of training such networks.

Judd addresses the issue of network learning rigorously, consequently there is reference to the topic of "theory of computation", with all its associated jargon, and non-theorists may find these parts a little hard going. However, the arguments following these discussions and definitions are quickly accepted, and the interesting conclusions drawn from the proofs are swiftly recognizable as important guides to network designers and users alike. Theorists and keen readers will find to their delight a further 24 pages of supplementary proofs amongst the appendices!

The book draws the reader onto twin peaks, of which the particularly interesting chapter devoted to studies of learning is the first, reached with a gentle struggle for want of a technical glossary. Then upward again, and with the central theorem established, each new paragraph draws a new conclusion. Each theorem is as important to commercial users as to researchers, the issues arising from the central theorem clearly needing to be addressed at the network design stage.

Being aware of the theorems that Judd derives will enable serious neural network users to make unusually informed decisions about products that they buy and projects that they undertake. Similarly, for those studying neural networks, having prior knowledge of the complexity issues should influence their examination of network topology and learning tasks. At the conclusion of Judd's book, with the theorems and tools that are put forward, the neural network designer is placed in the polynomial time driving seat—albeit without the ignition key.