complexity will continue at the same rate in the future. The rest of the article, significantly, is devoted to artificial intelligence, and in particular to its applications in expert systems. Alex d'Agapeyeff talks of the relative lack of success so far encountered in the use of expert systems. He says, more generally "I no longer believe mankind is ready for robots with common sense and a genuine capacity to learn from experience". Since he apparently once did believe in such things one wonders what has changed his mind. He follows this article with another on the "Practical elicitation for business applications", and here he further emphasizes the need for expertise.

Part two of the book on "Applications" naturally lays its emphasis on the way computers are used to solve problems, and uses the words "solve problems" rather generally. The papers in this part deal with the problem of systematic sea search by coastguards, the study of speech in linguistic terms as well as gestures, the visual control of intelligent robots illustrated by a number of examples, including snooker playing, and finally a paper on "Interactive Video: learning for the next generation".

Finally, in Part three, the first paper, by VS Shirley called "Computing and the competitive edge", deals with the automation of offices and the like, and the problems met particularly from "middle-aged managers who have 'always done things this way, keep your place young man—or woman'". The penultimate article in the book by Michael Jackson is on "Software Manufacture", and finally a rather unhappy article by Geoff Busby, a sufferer from cerebral palsy, who writes on "IT support for the disabled".

An appendix completes the book—one on the FRIL programming language which has been developed at Bristol University especially for use in the field of AI. Heuristics, semantics, cognitive science and logic are all catered for in what looks to be a very promising language.

The book as a whole is well produced and of great interest. In what is a vast field the contributions are nicely representative, and one realised that this sort of field could barely be covered by a set of many volumes, but the flavour has been well caught by a number of highly skilled contributors: a book to be strongly recommended.

Expert systems—a manager's guide by Karl Wiig, Management Development Series No 28, International Labour, Switzerland, 1990, pp 182, £12.50.

Reviewed by: Robert Milne, Intelligent Applications Ltd, Scotland.

In the past many books on expert systems have been written for the technologist. However, for expert system applications to be successful throughout industry, it is the manager who must take the initiative to start an expert system program and coordinate the successful development of applications.

As a result, there is a need for a book which can tell the manager what expert systems are, how to benefit from expert systems, how to get started and how to successfully develop an expert system team and expert system applications. This book is very successful at addressing that need. In a clear readable form, the book contains the information a manager needs in order to understand what the costs and benefits of expert systems are, to assemble a team, to learn what elements are needed within that team, to organize expert system projects, how to manage the development project, and how to see through the development and maintenance of knowledge-based systems.

The book does a good job of defining the basic technical terms and techniques, but without being over complicated. The writing style also makes it very easy to pick out the essential elements quickly. Extensive use of summary tables to outline the key facts and detail is made enabling the book to be used as a continuing reference guide, and helping to ensure its place on every manager's desk oriented towards expert systems.

Every book has a few areas which could be improved: the tables, although very useful, are often very wordy; the summary of expert system products and hardware is rapidly becoming out of date, although a snap shot of what is available at one time is given. Although the book contained a considerable amount of useful information, it could be made a bit more light hearted and a bit more motivating.

One of the major trends within expert systems today is the move for close integration with existing work environments and computer systems. Although the book provides a good catalogue of these types of integration, it describes expert systems as a stand-alone technology. It would help many managers to make it clearer throughout how best expert systems can be integrated with existing practices.

As a final complaint, the author seems to dismiss expert system shells on ordinary PCs as inadequate. Although it is wise to use the most powerful development environment possible, many companies have been very successful with small PC-based applications.

In summary, this book is highly recommended for every manager involved with expert systems, or hoping to bring expert systems into their company. It provides an excellent overview, not only of the technology of expert systems, but the management related issues.

Artificial experts: social knowledge and intelligent machines by HM Collins, MIT Press, Cambridge, MA, 1990, pp 258, £17.95.

Reviewed by: Richard Ennals, Kingston Business School, Kingston-upon-Thames, UK.

The field of artificial intelligence and expert systems has achieved a certain maturity in that following the waves of enthusiastic introductory texts, promising a great technological future but able to deliver little of practical value, we can now find a growing international literature which takes a more reflective and civilized approach. The tools of intelligent computing have fallen into the hands of non-computing specialists, who have found the experience provocative and productive. As the sociologist HM Collins notes in this book:

> "When one tries to put knowledge into a computer, the questions present themselves in an acute and well-defined form. That is why artificial intelligence research is a natural . . . laboratory for the science of knowledge."

This new generation of intelligent computer users brings refreshingly different perspectives and emphasis. Just as the French archaeologist Jean-Claude Gardin (1988) derives valuable insights for his discipline from the use of simple expert systems tools such as SNARK, a large part of Collins' book is devoted to an account of the use of APES to build a system to teach people to grow specialized semiconductor crystals. A similar level of technology stimulated Richard Susskind (1987) into investigations of expert systems in the area of jurisprudence. In each case the domain specialist has been motivated to take on the role of knowledge engineer, building demonstration systems that have to meet the criteria of the specialist domain rather than carrying forward the leading edge of research on advanced workstations.

In recent years a number of books (e.g. Graubard, 1988) have sought to challenge the concept of "strong AI", the building of intelligent systems that could replicate an ever-increasing range of human intellectual functions. The arguments have often focused on new developments, such as neural computing, which have challenged conventional, and for some discredited, simple principles of artificial intelligence. Where, as in the work of Searle (1984) Dreyfus (1987) and Leith (1990, 1991), the basis of the argument has been philosophical, the combative style has often served to antagonize the research community, who have felt forced on to the defensive, in some cases perceiving threats to ongoing funding. With the work of Goranzon and colleagues (1988, 1990) at the Swedish Centre for Working Life, where artificial intelligence has been considered in the context of culture, language and work, the unfamiliar style of the resulting literature has made it possible for the emerging case for human-centred systems to be ignored as marginal. Those who have sought to develop practical and socially useful demonstrations of alternative directions for the technology, such as the Artificial Intelligence For Society Club, founded at the BCS Expert Systems Conference in 1987 (Gill, 1988; Ennals, 1991) have found the task harder than anticipated, and some have found it easier to withdraw from such experimental, and unfunded, efforts.

Harry Collins has made a notable contribution to the debate in this book, which should strengthen the chances of dialogue and mutual understanding between social scientists and