Talking to computers

Conceptual Information Processing. (Fundamental Studies in Computer Science, Volume 3.) By R. C. Schank. Pp. viii+374. (North-Holland: Amsterdam and Oxford, 1975.) Dfl.75; $31.25.

How can we get computers to understand natural language? One way is to restrict conversation to a very limited domain such as noughts-and-crosses or the world of children's blocks and then to try to devise programs that will go through most of the mental operations that human beings perform when they talk to each other about such topics. In spite of some promising developments, the disadvantages of this approach are obvious: change an aspect of the simulated world—introduce a baby to play with the blocks—and sooner or later the semantic machinery will be unable to cope. An alternative method is to restrict not the topic of discourse but what the programs do. Mechanical translation, the white hope that became a white elephant, was a lesson in the dangers of an extreme version of this approach. Nevertheless, Roger Schank has opted for a wide range of discourse at the cost of limited comprehension, and the present book describes his work in great detail down to three chapters by his students based on their PhD theses. They have contrived some ingenious programs that will generate a list of paraphrases of a sentence or draw plausible inferences from it, for example, given: "John said he killed himself", their system responds: "Dead people can't talk." The drawback is, of course, that the programs are not really demonstrating a full mastery of language. They could not describe a dead man even if they had eyes to see.

The choice at present seems to be either articulate conversations with an idiot savant who knows only how to pile up wooden blocks, or the inferential responses of a deaf, dumb and blind kid who cannot even play a pinball machine. Neither alternative promises to deliver us an intelligent talking computer by the year 2001. Perhaps we should treat computers like babies and provide them with senses and voices, the ability to learn how to represent the world and to reflect on their own processes, and then talk to them for a few years. **P. N. Johnson-Laird**

Manipulating plant growth

Environment and the Experimental Control of Plant Growth. (Experimental Botany: An International Series of Monographs.) By R. J. Downs and H. Hellmers. Pp. vii+145. (Academic: London and New York, November 1975.) £4.50; $12.50.

MANIPULATING the environment is a technique used by experimental and applied botanists for many years in their search towards an understanding of plant growth, and the use of sophisticated controlled environment facilities has recently increased. The authors of this book have drawn on their considerable experience with such facilities to provide a monograph that will be welcomed by many researchers in the field. Their object was to collate information on environmental factors controlling plant growth and the methods of controlling these factors in turn, to enable biologists to understand what is required in the design and use of the facilities, in order to obtain acceptable degrees of control. In doing so, the authors have produced the first major book on the subject in over ten years since L. T. Evans' *Environmental Control of Plant Growth.*

There are chapters covering temperature, light, the gaseous environment, and water and nutrients. Each begins with definitions, followed by methods of measurement and design of facilities, and examples of the influence that each factor has on the development and growth of plants. The technical information is presented with clarity. The physiological data is necessarily rather limited, but each chapter is concluded by a comprehensive reference list. The value of the book lies in its considerable amount of practical advice based on the authors' experiences, with emphasis on the problems that may be encountered. The book is concluded by chapters discussing the controlled environment in relation to the natural environment and the various types of facilities available. The authors are directors of the South Eastern Plant Environment Laboratories in North Carolina, and naturally stress the advantages of phytotrons since a number of facilities are available and visiting workers are encouraged there. Their book will, however, prove especially useful to those with more limited facilities and little experience. **S. M. Thomas**

Look—no maths

Electrons in Metals: An Introduction to Modern Topics. By C. M. Hurd. Pp. ix+331. (Wiley-Interscience: New York and London, December 1975.) £9.95; $19.90.

DR HURD'S book is an ambitious project—the descriptive treatment of the major properties of electrons in metals without the use of mathematics. The author sets out to lead beginners in the subject through the tangled web of quasiparticles, Fermi surfaces and Kondo effects to gain at least a qualitative overview of the theory of metals. To do this the author has developed what would, at first sight, seem to be a logical framework, in that he starts with an atomistic view so as to relate the various types of metals to the periodic table. He goes on, for what is the largest section of the book, to treat the electrons as a fluid with increasing complexity, from the single-particle model to Bose condensation and superconductivity, before introducing the atoms back into the problem for a general review of cohesion and electron transport in metals.

A very large part of metal physics is covered at a fairly elementary level but this book suffers, however, from a number of major faults, which are inherent in this format. If one is to have a qualitative discussion of fairly sophisticated concepts it is necessary to provide a framework as simply and as early as possible. In the standard textbooks this would be achieved by either reference to the interplay between experiment and theory, which led to those concepts, or through a sufficiently simple model of a real metal that could be modified as one progressed in understanding. Neither of these has been followed by the present author and the simple single-particle model, on which the major part of the understanding of the electronic theory of metals can be based, is left until the final chapter. This means that many of the concepts, and indeed technical jargon, receive only the briefest mention on their initial appearance and the reader is constantly being referred forward to the later chapters. This would not necessarily be fateful, but coupled with the emphasis in large parts of the earlier parts of the book on the exception rather than the rule (as in, for instance, assymmetric scattering of electrons by impurities) must lead to terrible confusion for the beginner.

In general, although it does contain some very good non-mathematical descriptions of complex phenomena, this is not a book I would recommend for anyone without a good grounding in solid-state physics. **J. C. Inkson**