

tion do not threaten the integrity of the corpus.

The corpus, on the other hand, will certainly modify interpretations. The very number of "temples" and megalithic structures reported must suggest new functions and meaning. Every village settlement must have had one, and the next step will be some sort of locational analysis to see if the four or five really large temples might plausibly be seen simply as the major building for a large village, or whether they had some "metropolitan" function. My own guess is that the term "temple" is too specialized in its implications, and that we should think rather in terms of communal centres—parish halls as much as parish churches. There are plenty of ethnographic parallels for buildings used by the society as a whole (or by a large part of it) for a wide range of activities, some of them decidedly secular. We do not have to imagine the prehistoric Maltese going about their daily affairs in "a state of worship", as some authors would wish.

This splendid volume will offer new insights or lines of approach to many archaeologists. For example, the presentation of the Tarxien Cemetery material suggests to me that far closer Aegean parallels for this post-temple period will be found (in Early Helladic III and Middle Helladic Greece) than for the earlier phases. The bronzework admittedly could be earlier, but the bossed bone plaque, the one and two-handled cups and the multiple vessels all find echoes in middle bronze age Greece as well as in the Capo Graziano culture of the Lipari islands.

The systematic presentation of this material, then, marks a real step forward in Maltese prehistory. It does not pretend to tell us why the temples were built or the sculptures carved, but it does describe them fully and systematically, document the material equipment of their builders, and lay the indispensable groundwork for determining just when they were built. Professor Evans has given us a work which does justice to the remarkable, indeed amazing, creations of which he writes.

COLIN RENFREW

## Grand Mastery

*Computers, Chess and Long-Range Planning.* By M. M. Botvinnik. Translated by Arthur Brown. (Heidelberg Science Library, Vol. 11.) Pp. xiii+89. (Longmans: London, February 1971.) £2.50.

BOTVINNIK'S profound style of chess made him one of the greatest masters in the history of the game. For some time he has been researching into computer programs for playing chess, and his work has been awaited with considerable

interest. In this book he develops the principles which he believes should be the basis of a good chess program.

The book has two sections. In the first, Botvinnik gives his mathematical formulation of chess. The central idea is that of the intangible values of a piece; these are calculated in terms of the enemy men which the piece can attack in one or more moves. Botvinnik proceeds to give formulae for deciding whether a variation seems favourable, whether it should be examined further and so on. An interesting innovation is his "horizon method": in examining a possible move one considers only those pieces that can reach the relevant squares within a preassigned number of moves. Some remarks are offered on the difficult task of formalizing positional play. In the second section Botvinnik takes issue with the general practice of teaching the pieces how to make single moves. He gives instead tables ("clichés") which show the number of moves each piece requires to reach a given square on a clear board. This approach may well prove valuable.

It has been generally realized for some years that restrictions on the variations considered are necessary if the computer is to be capable of seeing deeply enough into the position. Relevant principles—development of pieces, control of the centre and so on—are familiar enough, but how are they to be programmed? At present no computers can play better than a moderate amateur. The real test of Botvinnik's ideas is whether they result in a significant improvement. Botvinnik, however, has not yet produced a workable program. He gives, as an "experiment", his celebrated combination against Capablanca, attempting to show that it could have been discovered by application of his theories. But he offers no reason why the computer should analyse the winning line of play to a depth of some twenty-five half moves (with Botvinnik a piece down throughout!). To find the line, the machine would need ideas about the value of advanced passed pawns, ideas not mentioned in the book. Nor is there any mention of the possibility of computers learning from experience, even though this seems likely to be the basis of future developments in the field.

The general outline of the argument is usually clear enough, but too often the technical detail is sketchy and the formalism obscure, to say the least. A typical example is the "important remark" on p. 16. The translation is competent and the presentation attractive, though there are a number of misprints. Unfortunately the price is quite unrealistic, for the text is only some fifty pages, supplemented by sixty positions "for study"—which seem perfectly useless—and some mildly relevant appendices. Also, the title has been altered, as part of an attempt to produce a coffee-table science book. The original title, "An Algorithm

for Chess", is more appropriate for what is essentially a blemished but interesting technical paper.

D. J. STRAUSS

## Ion Movements in Cells

*Membranes and Ion Transport.* Vol. 2. Edited by E. Edward Bittar. Pp. xi+295. (Wiley-Interscience: London and New York, December 1970.) £5.50.

THE publication of books on membrane function takes place with increasing frequency and there ought therefore to be some good reason for publishing a new, three volume analysis of the subject. The stated intention is to undertake a general survey of membrane function and to treat the subject both systematically and critically. The first volume, dealing chiefly with the organization of membranes and the more theoretical aspects of membrane transport, generally satisfies these two criteria. The second volume, which is concerned with ion movements in symmetrical cells and subcellular organelles, is less successful.

What I found disturbing is not so much that the survey lacks completeness—the omission of any reference to ion transport in plant cells surely not being justified—as that some authors show much more critical awareness of their subject than do others. This variability, which must of course always be present to some extent in a book of this nature, is highlighted in the present instance by the way the editor has chosen to present his subject. More or less equal space has been allowed in the first part of the book for articles on ion transport in seven different tissues. This is in spite of the fact that much more work needs to be reviewed by authors dealing with nerve, red blood cells and skeletal muscle than with any other tissue. The result has not been to cramp the reviews of ion transport in these three tissues—indeed, that by Hurlbut on nerve is excellent in all respects—but rather to encourage the remaining articles to expand out of proportion to their natural content. Part of this expansion takes the form of repetition. Is it necessary, for instance, to repeat potted definitions of transport and diffusion or to summarize the discovery of transport ATPase and describe the action of cardiac glycosides in quite so many parts of the same book, particularly when these subjects have been spoken about at length in the first volume of this series? Then must we have in duplicate the hoary old argument, which really has no answer, about whether it is better to use tissues *in vivo* or *in vitro* to study ion transport (ion movements in smooth muscle and brain)? Incidentally, the use of brain slices of 35 mm thickness (page 156) is not likely to advance the cause for *in vitro* work (the correct value is 0.35 mm). Further duplication arises in describing the use and misuse of extra-