

book reviews

Physicist on the pyramids

The Riddle of the Pyramids. By Kurt Mendelssohn. Pp. 224. (Thames and Hudson, May 1974.) £3.50.

DR KURT MENDELSSOHN, the noted cryogenist, has in this book turned his attention to the unrelated subject of Egyptology, in which he confesses an intense amateur interest, and in particular to the riddle presented by the pyramids. Students of the subject may well heave a sigh at the addition of yet another title to the immense literature on Egyptian pyramids which has been written since the days of Herodotus. They may also view with misgiving the entry of a physicist into this unfamiliar field, bearing in mind the intervention of an earlier scientist, Piazzi Smith, the Astronomer Royal for Scotland, who in 1877 produced in his work *Our Inheritance in the Great Pyramid* a source of endless inspiration to the obscurantists who caper on the fringes of the subject. Such fears may immediately be set at rest: Dr Mendelssohn has a unique contribution to make which deserves very careful consideration by the experts as well as the attention of the general reader to whom this book is primarily addressed.

What the author sets out to do is to produce some rational explanation of why such an immense effort was made in raising the great stone pyramids of Egypt over four and a half thousand years ago. The usual explanation advanced by Egyptologists is that such edifices were the tombs of kings who were regarded as gods incarnate, and who according to the religious ideas of the age had to be buried in or under them to ensure the prosperous continuation of the divine government of Egypt. Dr Mendelssohn finds this an inadequate explanation. Some at least of the royal tombs of the Pyramid Age were cenotaphs and what he has to say about this aspect of the problem (pages 74-77) is well worth pondering. He admits that the pyramids served as royal mausolea, not necessarily tombs, but he considers that their funerary function was not the only purpose of their construction, or indeed even the main one.

The point of departure of his enquiry is a discussion of the construction problems presented by the large stone pyramids at Meidum, Dahshur and Giza. He has already formulated most of his ideas in recent papers in the scientific journals, but in this book

he is able to expand them significantly. The step pyramid which raises its impressive tower above extensive mounds of debris on the desert verges at Meidum was evidently completed by Sneferu, the first king of the fourth Dynasty in about 2600 BC, by adding a cladding of fine limestone, thus converting it to the first true pyramid in Egypt. All the archaeologists who have excavated this monument have agreed that the loss of the outer casing was due to the subsequent operation of stone thieves who used the pyramid as a quarry. Dr Mendelssohn will not accept this finding and has produced impressive testimony to show that the Meidum pyramid collapsed during its final building because its structure had a number of inherent weaknesses. He draws a comparison with the Aberfan disaster; and certainly the aerial view of the pyramid given in his plate 23 clearly shows the plastic flow of the ruined mantle around its nucleus. The shearing-off of this outer covering by such a catastrophe also explains satisfactorily certain architectural features evident in the remaining core and the extraordinarily high mounds of rubble at its base. There are few Egyptologists who will wish to challenge these arguments of Dr Mendelssohn, and pending any final discoveries that may be made by the complete excavation of the pyramid, we may regard his explanation as the most plausible that exists.

The author then proceeds to discuss the effect of this disaster on the design of subsequent pyramids and tries to show that it was responsible for the abrupt change of angle in the Bent Pyramid at Dahshur and for the character of its mantle. He also argues that it promoted improvements in the design of the North Pyramid at Dahshur and the three giants at Giza. If his arguments be accepted, some revision of our views about pyramid building is required since it is clear that two or more great pyramids were being built at the same time during the reign of Sneferu at least, and the implications of all this form the second and more provocative and perhaps more interesting part of the book.

In essence the author's argument is that the consecutive construction of pyramids, one during each reign, is an economic and organisational impossibility. Owing to their immense size the building of pyramids on the scale undertaken in the Fourth Dynasty had become an activity in its own right

demanding its own economic rules. It was the pyramid and not the pharaoh that ruled Egypt; and new pyramids had to be raised whether a pharaoh was ready for burial or not. The erection by the genius of Imhotep of the first great stone building in Egypt, the Step Pyramid of King Djoser in about 2680 BC, began a movement which escalated into a self-sustaining process that affected the seasonal employment of a vast army of workers whose communal feeding, clothing and upkeep for several months during each year must have completely revolutionised the pattern of life for the whole country. A central administration became responsible for the livelihood of a great proportion of the rural and artisan population in place of local councils and village elders. In short, the immense communal activity of building the pyramids created the cohesive Egyptian state with its cohorts of civil servants, and could not be abandoned though it was subsequently modified.

This brief analysis may not do full justice to the author's thesis which is persuasively argued with analogies to the later Mexican pyramids and modern state enterprises. Of course not all the interpretations will command the approval of Egyptologists who form a notoriously sceptical body of opinion; nevertheless we should be grateful to Dr Mendelssohn for obliging us to re-think the received view of the Pyramid Age. One of his readers, at least, will be unable to look again at the monuments of Meidum, Dahshur, Sakkarah and Giza in quite the same old way.

CYRIL ALDRED

Making electricity

Thermionic Energy Conversion. Vol. 1: Processes and Devices. By G. N. Hatsopoulos and E. P. Gyftopoulos. Pp. xi+265. (MIT: Cambridge, Mass. and London, 1973.) \$17.95; £9.00.

THE increasing interest in alternate energy systems makes the appearance of this book apposite; unfortunately like *The Times* it is wise after the event. The method of converting heat to electrical energy described requires thermal sink temperatures high by comparison to room temperature thus making the method suitable in principle for space use. The buildup of the US space programme thus corresponded to a time of intense activity in this field: the rundown of space activity has led to the demise of thermionic energy