B.C. During the Middle Preclassic (900 to 500 B.C.) the site grew tremendously. Structure E3-1-2nd, in the El Trapiche Group, reached a height of more than 20 meters, and it seems probable that other mounds in the El Trapiche Group were begun during this time.

A number of ceramic types and modes in the Middle Preclassic are reminiscent of Olmec ceramics, and these similarities, plus the undeniably Olmec-style boulder carvings at nearby Las Victorias, suggest to Sharer an Olmec presence of some sort. He argues that "it seems more reasonable to conclude that the Olmec contacts are the result of the establishment of a station or settlement at or near Chalchuapa to control the supply of local materials in demand in the Olmec homeland, perhaps cacao, hematite and obsidian." Actual Olmec presence is of course possible, but we are far from understanding the nature of "Olmec" influences outside their southern gulf coast heartland, and I regard the evidence as ambiguous. The ceramic links and the one sculptured stone might well be explained by less drastic influence. Sharer also suggests that the tremendous size and probable importance of Chalchuapa in the Late Preclassic might have been stimulated by this initial Olmec contact.

Several years ago Sharer and James C. Gifford noted that several Middle Preclassic Chalchuapa ceramic types were very closely related to contemporary or slightly later types of the Xe and Mamom ceramic complexes in the Peten. For this reason they hypothesized that part of the Preclassic lowland Maya might be traced to western El Salvador. Now that the account of the Chalchuapa pottery has been published, ceramists will be better able to judge this claim.

The Late Preclassic marked a period of accelerated growth. Structure E3-1 was rebuilt, reaching a height of about 25 meters, and the platforms of the El Trapiche Group eventually covered about half a square kilometer. The pottery of this period is closely related to that of the Late Preclassic Kaminaljuyu, and architectural complexes also seem reminiscent of groupings at that site. A badly eroded Late Preclassic stela from the El Trapiche Group that bears a possible *uinal* glyph adds to the evidence that Maya hieroglyphic writing may have originated in the southern highlands, rather than in the lowlands.

The Preclassic florescence of Chalchuapa seems to have been brought to an end by a massive volcanic eruption at what is now Lake Ilopango, beside modern San Salvador, perhaps about A.D. 200 or 300. Sharer and Sheets argue that sufficient ash fell in the area around Chalchuapa to disrupt local cultural development, that the Protoclassic Floral Park intrusion in the eastern Maya lowlands was probably the result of emigration from western El Salvador, and that at this time the southern highlands lost preeminence to the lowlands, never to regain it. Perhaps, they venture, this eruption was only "a single instance of possible widespread volcanic activity that depopulated vast areas and tore apart the fabric of highland Maya society at the close of the Preclassic." Could the decline of the Maya highlands relative to the lowlands have been the result of a chain of cataclysmic eruptions? A further inference is that the intrusion of Teotihuacan elements at Kaminaljuyu in the Early Classic might have been a "by-product" of this collapse, rather than a cause. These suggestions are sure to provoke heated comment.

The results of investigations in Classic and Postclassic remains are less earth-shaking, in part because of the unavailability of many of the Tazumal data. The Central Mexican architectural features at this huge restored complex suggest to Sharer the arrival of Nahuat-speaking Pipil groups in the Early Postclassic, and the presence of Chinautla Polychrome sherds in Late Postclassic deposits may be ascribed to Maya Pokomam peoples whose presence at Chalchuapa is documented in early historical accounts. But after the Preclassic, despite the close Late Classic ceramic ties to the important southeastern Maya site of Copan, in Honduras, Chalchuapa remained peripheral to Maya culture.

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A Russian View of Desertology

Deserts of the World. M. P. PETROV. Translated from the Russian edition (Leningrad, 1973). Halsted (Wiley), New York, and Israel Program for Scientific Translations, Jerusalem, 1977. viii, 448 pp., illus. + loose maps. $57.50.

Petrov's book deals extensively in its 15 chapters with the Russian research done on the large deserts of middle and central Asia, fitting it into the framework of desert investigations all over the globe and comparing it with the results of desert research in general. The most important Russian contributions are concerned with the physical features of the Russian and Chinese deserts, which are dealt with in 30 pages (the deserts of North America get only 6½ pages) containing much new material (for example, meteorological and climatic data from new meteorological stations and accounts of geomorphology and soils), and with the environmental conditions in these deserts, especially sandy deserts. There is also much new material on the practical exploitation of Russian deserts. There are a number of comparative tables, including one on the classification of Asian deserts, that are original and helpful even though one may not agree with all the details.

Sandy deserts in general get much more attention than other desert types, apparently because Petrov's original intention was to restrict the book to them. Perhaps the best part of the book is that which deals extensively with these deserts and with the movement of sands in general.

In other interesting chapters Petrov compares the physiographic landscapes of deserts and discusses the process of desiccation and the pattern of adaptation and convergence in desert animals and plants. Here again the accent is on Russian research and much interesting information is made available to the Western reader.

The last three chapters of the book treat the use of deserts today and in the future. The focus of these chapters is on the enormous effort of the Russians to open virgin desert land to practical use: to use "phytoreclamation" to create new grazing grounds, to irrigate the desert by diverting large rivers and by constructing enormous canals thousands of kilometers long, and to build vast hydroelectric and industrial complexes. The size of the efforts and plans is overwhelming. Petrov states that the Russians intend to bring 20 million hectares of virgin land, 10 percent of the entire desert area of middle Asia and southern Kazakhstan, into cultivation and at the same time to turn the area into one of the largest energy-producing regions of the U.S.S.R. But is it not slightly premature to conclude that "deserts can no longer be categorized as unproductive and barely utilized areas as they have now become highly productive"? It is also typical of this kind of optimism that Petrov only here and there hints at the dangers involved in making the desert "productive," dangers with which we have become only too well acquainted during the last ten years.

It is unavoidable that a book of this scope contains some rather doubtful statements, such as that "desert

crusts . . . are all relict formations" (p. 126) or that oil drops and crystal of calcium oxalate in plant tissues have a "protective role and raise the resistance of plants to heat and drought" (p. 306).

All in all, the main merit of the book is that the author, who is himself an eminent desertologist, deals so largely with the Russian literature, which is often not easily available outside Russia. The book is therefore indispensable for desert researchers.

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Biomechanics

Mechanics and Energetics of Animal Locomotion. R. MCN. ALEXANDER and G. GOLDSPINK, Eds. Chapman and Hall, London, and Halsted (Wiley), New York, 1977. xii, 346 pp., illus. $37.50.

"Our knowledge of animal locomotion has advanced remarkably in the past two decades. . . . It seems a good time to produce a book." These words from the preface of Alexander and Goldspink's book tell us why they have solicited several of the most expert researchers in muscle biology, locomotor coordination, and biomechanics to write reviews covering a remarkable range of topics in these fields. The result is not a volume for those hoping to learn of the newest, heretofore unpublished, investigations of the contributors, nor will it serve as a textbook to introduce novices to their efforts. Rather, it seems best suited for the reader who has a basic knowledge of the relevant subjects but has been unable to keep abreast of developments as well as he or she has wished.

Three of the 11 chapters in the book cover material to which I have had little previous exposure. Of these, D. V. Holberton's contribution on the locomotion of protozoa and single cells is particularly impressive because it combines anatomy with experimental and theoretical biomechanics to produce a true functional morphology of cilia, flagella, and pseudopods. F. Delcomyn carefully analyzes the role of central programming in invertebrate locomotion, drawing attention to the important fact that walking differs from flight and swimming by virtue of its greater dependence on continuously monitored sensory input. The chapter by E. R. Trueman and H. D. Jones is a short compendium of the different ways in which snails, worms, and larvae manage to anchor one portion of their bodies in order to propel the remainder for the purposes of locomotion and burrowing.

The review of the molecular and cell biology of muscle by D. C. S. White is highly readable and requires the least in the way of previous knowledge on the part of the reader. M. C. Wetzel and D. G. Stuart author a chapter on the coordination of vertebrate locomotion, but concentrate rather heavily on the location of the central program for stepping in the cat.

The majority of the chapters in the book are contributed by the editors. Alexander, one of the most creative researchers in the field of animal mechanics, discusses terrestrial, aquatic, and aerial locomotion. He touches on many fascinating problems, some rather briefly, but of special value is his discussion of energy conservation by elastic storage in tendons. However, while reading some of Alexander's sections I felt that complex mathematical analyses were being pursued as much for their own beauty as for their ability to illuminate biology. Quite the opposite impression is conveyed by Goldspink's excellent chapters on energetics of muscle and locomotion, where clear emphasis is placed on the biological significance of the data. The discussion of different fiber types and their relationship to locomotor behavior is the best I have read.

In summary, this book comprises a set of fairly independent reviews to be read selectively by those wishing to compensate for deficiencies in identifiable areas. A high level of scholarship is in evidence throughout the work.

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