

pox. It is obviously essential that the extent of the relationship between all these virus strains be clearly established and a start in this direction has been made.

Marennikova and colleagues (*Arch. Ges. Virusforsch.*, **33**, 201; 1971) compared the morphology of five isolates of simianpox virus and found that four out of the five viruses formed a homologous group differing in some respects from other poxviruses. The other strain of virus, which was isolated from apparently healthy monkey kidney, was indistinguishable from variola virus. Rondle and Sayeed (*Bull. Wld Hlth Org.*, **46**, 577; 1972) studied the growth characteristics and serological reactions of three monkeypox virus strains and found that monkeypox strains constitute a homogeneous poxvirus entity but that they can be differentiated from other poxviruses and that serologically they are more closely related to variola than to vaccinia or cowpox viruses.

To date thirteen confirmed cases of monkeypox in man have been reported from Liberia, Sierra Leone, Nigeria, Zaire and the Ivory Coast and some possible implications should be considered. Is there in West Africa a smallpox-like disease in animals which can spread to human populations? It is of interest to note that a fatal pox disease in *Mycetes* and *Cebus* monkeys in remote Brazilian forests was reported by Blayer as long ago as 1922 (*Munch. Med. Wschr.*, **69**, 1009), yet an intriguing observation is that in spite of extensive field surveys monkeypox in monkeys seems to be rare in West Africa and even serological surveys have yielded poor results. Yet a corollary to the first question is what is the possibility of epidemics arising in man once the present primary protection against smallpox has waned? Many ecological factors are undoubtedly involved in the distribution of viruses and these have not been clearly defined; but the need for the continuation of smallpox surveillance programmes is paramount.

FOSSIL RECORD

Palaeontology Moves On

from a Correspondent

FOR the meeting of the Palaeontological Association at Oxford on December 18-20, the council invited talks on all aspects of the subject, which has evolved considerably in the past decade.

Six contributors were concerned with the origins of higher taxa; Dr J. W. Valentine (University of California, Davis) outlined more theoretical aspects of phyletic interrelationships, and Dr R. P. S. Jefferies (British Museum (Natural History)) discussed the origin of the chordates on the basis of the early Phanerozoic fossil record. Other

speakers based conclusions directly on fossil evidence, and in particular reflected the impact of scanning electron microscopic studies on skeletal micro-architecture and its phylogenetic significance.

The role of the palaeontologist in the interpretation of ancient environments received attention from several speakers, as did problems of functional morphology and palaeoecology of extinct organisms. All speakers in these categories revealed the extent to which palaeontologists have moved into the fields of ecology, and showed how ecological studies on living organisms are becoming an important factor in both the teaching of, and research in, the subject. Dr J. H. Lipps (University of California, Davis) reviewed work on adaptive strategies of Recent Foraminifera with its obvious consequences in the understanding of the palaeoecology of the group, and R. M. Kier (Smithsonian Museum, Washington) showed spectacular time lapse films of living echinoids which revealed many functional aspects; this work should prove valuable in assessing the nature of comparable features in related extinct forms.

Studies on regional faunal distributions and their role in the interpretation of ancient geographics received attention. Dr J. Murray (University of Bristol) outlined a Tertiary reconstruction of Western Europe based on comparisons with Recent foraminiferal

assemblages, and Dr M. Hart (Plymouth Polytechnic), who drew his evidence from land-based samples and also JOIDES cores, demonstrated the value of regional microfaunal studies in understanding the early history of the Atlantic.

HAEMOGLOBIN

Intermediates in View

from our Molecular Biology Correspondent

New essays in fitting mathematical models to haemoglobin oxygenation curves tend nowadays to provoke in the outsider, depending on temperament, either mounting hysteria or a contented indifference. Even to the interested, the dispiriting suspicion that one has been here before is hard to fight down. But this is deceptive, for much progress has been made, and in particular Perutz's model for the oxygenation mechanism, which seems to follow almost irresistibly from the structural differences between the oxygenated and unliganded forms, has placed something of an obligation on physical chemists to see how equilibrium and kinetic properties in solution fit into this quite explicit framework. An important step in this direction was made by Ogata and McConnell (*Biochemistry*, **11**, 4792; 1972) who, while adhering to the principles of a fully concerted mechanism as the basis of co-

States of Myosin

THE contraction of muscle involves a displacement of myosin cross-bridges between the thick and thin filaments. When ATP is absent the bridges are in contact with the actin filaments, while making an angle of about 45° with the myosin filament axis. In the presence of ATP, on the other hand, they lie perpendicular to the thick filaments. The movement of the bridges between these states is presumed to lead to displacement of the thick and thin filaments relative to each other.

Analysis of myosin ATPase kinetics has shown that the rate-limiting step is the dissociation of the products, ADP and phosphate, from the active sites. The dissociation of the actin-myosin complex by the ATP is rapid. Thus when ATP is present one observes only the state in which the myosin is complexed with the hydrolysis products. An article by Mannherz *et al.* in next Wednesday's *Nature New Biology* (February 21) deals with the situation brought about by use of an ATP analogue, α,β -methylene-ATP, which differs from ATP in that the release of the hydrolytic products is rapid. Thus in the presence of this form the predominant structural state will be the

one in which the active sites carry substrate rather than product.

The results show that the actomyosin complex in this system is unstable, myosin being dissociated from F-actin in the ultracentrifuge. In muscle fibres this effect is reflected by complete relaxation on addition of the analogue. Furthermore, the characteristic 145 Å reflexion in the X-ray pattern of insect flight muscle containing ATP vanishes when the ATP is replaced by the analogue. Because the 145 Å reflexion is associated with the perpendicular position of the cross-bridges, and its absence is also a characteristic of muscles in rigor, it follows that the bridges either enter their angled configuration, or possibly are in some way randomized.

These results support the view that the ATP complex is associated with a different structure from that of the ADP complex, and that the ATP is normally hydrolysed on the back-stroke of the bridges before they return to their perpendicular orientation. This sequence is also required by the kinetic rates, which indicate that the enzymatic activity resides in myosin uncomplexed with actin.