PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

Introduction

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Introduction

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Extraordinary fossils are so firstly because they reveal the morphology of soft non-mineralized parts of plants and animals. We marvel at what is preserved, and ask questions about the organisms, their ecology and evolutionary relationships. While these fossils are rightly regarded as exceptional, any particular biota is not therefore unrepresentative, a curio of no general or geological significance (Zangerl 1971). On the contrary, the biota may be more representative of an original community than the remnant assemblage of hard parts we get under more usual geological conditions. Soft-bodied animals dominate modern marine faunas, and may well have done so since the Precambrian. Fossil Lagerstätten in which such animals are preserved provide unique insights into past communities.

Fossils such as *Tullimonstrum* (Johnson & Richardson 1969) from Mazon Creek, *Ainiktozoon* from the late Silurian of Scotland (Ritchie 1985), or the Burgess Shale *Opabinia* (Whittington 1975) and *Wiwaxia* (Conway Morris 1985) are extraordinary because the body plan is not like that of any animal living today. Our reaction may be to leave such animals out of account in discussing evolutionary pathways, or to interpret them so that they may be fitted in to some existing higher taxon. As detailed investigations of particular fossils have confirmed and emphasized strange morphologies, we are having to admit that strange body plans that have become extinct were part of the early radiation of metazoans. Concomitantly other discoveries have shown how ancient are the lineages of many living animals.

I participated in the 1969 symposium in Chicago on 'extraordinary fossils' which was conceived and led by the late Eugene S. Richardson, Jr (1971). Stress was laid on the exceptional preservation of the fossils, but much of the talks and discussion centred around the geological history of particular deposits, including facies relationships, taphonomy and diagenesis. Such knowledge is essential to interpreting the fossils, and about this time Professor A. Seilacher and his colleagues began their work towards understanding and classifying fossil Lagerstätten, as they called them. Most welcome here is a new statement of their ideas with discussion of examples. Rapid burial is clearly an important factor in these preservations, resulting in what are termed 'obrution' deposits. The use of this term is queried by Riding, an English equivalent being 'smothering'; the term is presumably derived from the Latin *obruo*, to cover, overwhelm, hide in the ground, or bury. That the deposit must be poor or lacking in oxygen is important, as is the role of early diagenesis. These factors are alluded to here by most authors, and reveal a bewildering variety of little-understood special conditions that characterize individual deposits. The danger of accepting any classification is that of having to minimize or ignore particular cases to avoid any modification of the accepted arrangement.

The Chicago meeting considered neither Precambrian fossils nor Phanerozoic plants. The spectacular growth in knowledge of the former, and the widened range of studies of coal balls, for example, pose problems in every aspect of preservation, ecology and evolution. Exceptional

biotas provide a most important sample of past life, but one that occurs sporadically in time and space and is biased in respect of environment of origin. The record of this meeting includes brief accounts of new discoveries that fill gaps, and of re-investigations of earlier known deposits, and will serve as an introduction to the problems posed and progress being made toward answering them. Much remains to be done in amplifying the light shed by these extraordinary biotas on palaeoecology, community structure, and evolution.

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