FOREWORD

The base of the Cambrian Period is one of the great watersheds in the history of life. In the earlier half of the nineteenth century, Charles Darwin had already recognized the startling change that happens in the fossil record at this horizon, when the fossil remains of metazoans appear in abundance for the first time in many localities around the world. The dawn of the Cambrian marks the appearance of mineralized shells, which apparently originated independently in several animal groups shortly after the beginning of the period. A century or more of careful collecting has only reinforced the distinctiveness of this seminal phase in the story of marine life. Initially, paleontologists concentrated on documenting the sequence of shelly fossils through the interval, in order to establish a basis for the correlation of marine strata. Trilobites—now supplemented by microfossils, like acritarchs—have proved to be of particular importance in stratigraphy for all but the lowest part of the Cambrian, and for a while our picture of early life was colored by the kind of shelly fossils that could be recovered from collecting through the average platform sedimentary rock sequence. However, there was another world that the usual fossil record did not reveal, a world of soft-bodied, or at least unmineralized, animals which lived alongside the familiar snails and trilobites, but which usually left no trace in the fossil record.

C. D. Walcott's discovery of the Middle Cambrian Burgess Shale in 1909 cast a new light upon this richer fauna. Thirty years of intensive study by several specialists at the end of the last century have made this fossil fauna one of the best known in the geological column. As well as fossils of a variety of animals that could be readily assigned to known animal phyla, the fauna included a number of "oddballs" which have stimulated much debate: were they missing links on the stem-groups of known animals, or completely new designs which left no progeny? Thanks to S. J. Gould's 1989 book *Wonderful Life*, the Burgess curiosities became well known to general readers from Manchester to Medicine Hat. But what once seemed like a unique window on to the marine world of the Cambrian has since been supplemented by other discoveries no less remarkable. Professor Hou's discovery of the Chengjiang biota in Yunnan Province, China, in 1984 proved to be a revelation equal to, or even exceeding, that provided by the fauna of the Burgess Shale. In the first place it was even older, taking us still closer to what has been described as the "big bang" at the dawn of complex animal life. Second, its preservation was, if anything, more exquisite. Third, an even greater variety of organisms was preserved—some, evidently, related to Burgess Shale forms, but others with peculiarities all of their own. The awestruck observer was granted a privileged view of a seafloor thronging with life, only (geologically speaking) a short time after the earliest shelly fossils appeared in underlying strata. The fauna included what have been claimed as the earliest vertebrates (*sensu lato*) and thus has more than a passing claim to interest in our own anthropocentric species. There are arthropods beyond imagining, "worms" of several phyla, large predators, and lumbering lobopods; while the trilobites, so long regarded as the archetypal Cambrian organism, are just one among many successful groups of animals. Once you have seen the Chengjiang fauna you will be forced to shed

your preconceptions about ecological simplicity in early Phanerozoic times. This was a richly varied biota.

This book brings together marvellous color photographs to provide us with an album of Cambrian life. It is the first comprehensive "field guide" to the Chengjiang fauna. Think of it as the equivalent of one of those manuals people take to the Great Barrier Reef to identify the marine life—but here the seafloor is 525 million years old. It is a world full of surprises. The velvet worms—today represented by tropical terrestrial animals—were then much more diverse, some of them plated, spiky, odd-looking creatures. Marvel at the preservation of the comb jelly, the most delicate of marine organisms, destroyed today by the glance of an oar, but here preserved for hundreds of millions of years in almost incredible detail. Worms seem almost to be laid out upon the dissecting slab ready for inspection.

This book is much more than a mere picture gallery. The Chengjiang animals are tangible evidence of the evolutionary forcing house at the base of the Paleozoic that generated the "roots" of all the biodiversity of our living world. They bear upon fundamental questions about the generation of novelty of design. Is it feasible that so many radically different patterns of organismic construction could be derived from a common ancestor after the alleged "snowball Earth" some 600 million years ago? If so, what are the implications for genetic development? Could permutations in the expression of homeobox genes be responsible for the apparently rapid diversification of these animals? The beautiful fossil remains laid out upon their slabs of mudstone are recalcitrant facts that have to be incorporated into any scenario of molecular evolution, an invitation to further discovery, a challenge to biologists and paleontologists of the future. One thing is certain: the evidence from China will be forever built into the scientific edifice.

Or you can, if you prefer, take a delight in the aesthetic qualities of the images. You can allow your imagination to travel back to a world in which the sea swarmed with not-quite-shrimps, and the giant predator *Anomalocaris* preyed upon almost-amphioxus. Several of these animals had eyes: they looked over the living seafloor just as we contemplate the carcasses of the organisms they once observed. Paleontology is not a "dead" science. Its principal concern is to bring to life worlds that would otherwise lie forgotten and undiscovered within the rocks. It is to be hoped that this book will stimulate another generation in the quest for animals still undreamed of, vanished ecosystems still waiting to be unearthed.

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