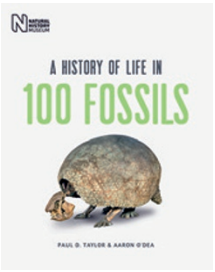
Life on Earth



A History of Life in 100 Fossils

By Paul D. Taylor and Aaron O'Dea

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Life is a miracle relived when every child is born. We take life for granted. It is easy to imagine life now to be what it was in the beginning and what it ever shall be, world without end. But our Earth tells a different story, a story of unceasing evolutionary change. Life appeared very long ago, and was very simple — so simple that we have difficulty recognizing life in its earliest forms. How did we get from the beginning to where we are now? That is the story of this book.

A History of Life in 100 Fossils looks like a coffee-table picture book — which it is, with wonderful illustrations — but the book is also much more: one hundred stepping stones from the Earth's deep-time past to its shallow present, each artfully illustrated by an iconic fossil. There were in fact billions of steps in an uncountable number of evolutionary lines, many still unknown. But one hundred steps in a few of these lines are enough to engage us as readers and give us a sense of how life has changed through the course of time.

The book starts in Australia with fossilized filaments described from the 3.5-billion-year old Apex Chert. These filaments are so small they cannot be seen with the naked eye. They were first interpreted as photosynthetic blue bacteria — known as cyanophytes — but not surprisingly subsequent authors have argued that they are hairline fractures filled with inorganic minerals. The study of early life is not easy.

An indisputable signature of early life occurs in the form of fossilized stromatolites. Still found today, stromatolites are formed by microbial communities that now include microbes capable of oxygen-producing photosynthesis. Similar communities are recognizable on an early Earth, possibly as far back as 3.5 billion years. More advanced organisms appeared much later, at 600 million years or so, in the Ediacaran biota. These soft-bodied impressions — found not only in Australia, but also in a few select locations including England, Namibia and Canada — are generally regarded as multicellular animals but there are competing interpretations, too.

Moving into the Phanerozoic eon — the 'time of abundant life' — signs of life become clearer, but the history reflected by these signs becomes more complicated. The Phanerozoic started with the Cambrian explosion, when animals with mineralized skeletons appeared more or less everywhere. This early burst of diversification resulted in the emergence of representatives of most of the animal phyla living today.

Eighteenth- and nineteenth-century study of the fossil record led to recognition of successive Palaeozoic, Mesozoic, and Cenozoic eras within the Phanerozoic, filled with ancient, middle, and recent animals, respectively. And thus the geological timescale was born. Radiometric calibration in the twentieth century told us the Palaeozoic 'era of trilobites' began about 540 million years ago, the Mesozoic 'era of dinosaurs' started about 250 million years ago, and the Cenozoic 'era of mammals' about 65 million years ago. Further, we now know these eras were discrete, separated by catastrophic extinction events that were followed in turn by bursts of new diversity.

A History of Life in 100 Fossils is historical in placing interesting fossils where they belong in time, but it also describes the interactions between these animals and their place in the environment: introducing arms-race escalation, continental drift, dwarfing, extinction, flight, geographic refuges, life habits, living fossils, mass mortality, parasitism, parental care, predation, preservation, punctuated equilibria, return to the sea, sexual selection, stratigraphic correlation, survivorship, swimming, symbiosis, symmetry, vision, and other intriguing subjects along the way. Small mistakes are inevitable when authors cover so much material, and I saw a few in the subjects I know best. These are minor, and I found myself wondering if they were cleverly deliberate to engage the attention of experts (for example, on page 116, is 'survival of the fittest' really Darwin's phrase?).

Each illustration of a fossil is accompanied by an engaging essay explaining what is interesting about the fossil or how the fossil sheds light on a bigger question. The book could easily serve as a self-guided overview of the fossil record, or as a valuable source of visual material and text for a formal course in palaeontology. The fossil record is more complicated and even more interesting than can be represented by 100 fossils, but this is a great place to start.

Human lives are short. The scale of geological time and the ubiquity of evolutionary change are thus sometimes hard for people to grasp, but the evidence is preserved in the rock and fossil record on every continent. The history of life is one of unceasing change, slow or fast, and the change will undoubtedly continue. Keep in mind as you read and enjoy the photographs that it is a miracle we know anything at all about the history of life. It is a blessing that we have fossils like the ones illustrated here. These are the classics, but also remember that beautiful and informative fossils are being found all the time. ❐

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