History of Life on the Earth: an Introduction to Palaeobiology. 3rd Edition, revised (in Polish), 523 pp. Wydawnictwo Naukowe PWN, Warszawa (2003)

Dzieje życia na Ziemi. Wprowadzenie do paleobiologii. Wydanie 3., unowocześnione

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Contents. In the book a modified Simpsonian methodology of inference, referred to as chronophyletics, is used to review the fossil record of the evolution with its time and space coordinates. Data on fossils is graphically arranged according to their geological age, morphology and (if relevant) geographic location. The most parsimonious ancestor-descendant relationship hypotheses joins them up in a phylogenetic tree. It is argued that such hypotheses are falsifiable if retrodiction is used as the way of reasoning.

A few introductory chapters explain methods of inference in historical geology, taphonomy, palaeoecology and phylogenetics. In the main body of the book expansion of the ecospace and enrichment of ecosystems in the geological history of biosphere is reviewed. The concluding chapter presents philosophical aspects of such an approach. Contents and main theses of successive chapters:

Introduction Parsimony (including uniformitarianism as its special form) and testability demarcate science from art and religion. Chapter 1. Reading the fossil record: Taphonomy of skeletal, soft body and trace fossils, extraction and presentation of data on fossil assemblages. Identification of paleophena ('fossil populations') is the main goal of basic research on fossils and unit of further studies. Chapter 2. Geological and ecological time: Application of short (environmental) and long term (evolutionary) processes to geochronology. Being unrepeatable, evolution is the most reliable basis for low resolution dating in geology. Chapter 3. Ways to restore evolution: Methods of inference on the course of evolution from morphologic diversity and stratigraphic succession. There is no possibility to prove that evolution was discontinuous but this idea can, and already has been, falsified. Chapter 4. Environment of evolution: Geological background of environmental changes and fossils as indicators of ancient environment. The theory of island biogeography offers an inspiring way of thinking about past ecosystems. Chapter 5. The early life: The nature of life and geological evidence on its evolution from RNA molecules to first metazoans. No reliable evidence on early life is available; the Ediacaran environment was extreme of its time. Chapter 6. Pedigree of reefs: Introduction and evolution of calcareous and siliceous skeleton in sessile animals. Investment in mineral skeleton was enforced by predation; ancestry of filtrators remains unknown. Chapter 7. Evolution in the mud: History of adaptation to infaunal and epifaunal 'iceberg' life on muddy bottoms. The change from active epifaunal to infaunal life was enforced by predation at the beginning of Cambrian. Chapter 8. Grazing over the sea bottom: History of adaptation to active epifaunal life; development of gait and ability to crawling. Predation forced freely living Cambrian animals to develop protective external cuticular skeleton. Chapter 9. First swimmers: History of adaptation to swimming by waving the body vertically or laterally and by jet propulsion. Hydrostatic abilities preceded efficient propulsion in cephalopods, opposite to the history of aquatic vertebrates. Chapter 10. Sea monsters: Succession of large predators in changing environments of the late Palaeozoic and Mesozoic. Most cases of ecological replacement of one taxon of large predators by

another await explanation. Chapter 11. Colonies of clonal organisms: Evolution of morphological differentiation within colonies of genetically uniform animals (bryozoans and graptolites). Gene duplication and subsequent introduction of regulatory homeotic mechanisms enable zooid polymorphism. Chapter 12. Invasion of plants on the land: Algal ancestry, origin and Palaeozoic evolution of vascular plants; first Carboniferous and Permian forests. Expansion of protective walls from zygote through tetrads to spores resulted in origin of the sporophyte generation. Chapter 13. Colonizing the land by animals: Adaptation of fungi, arthropods, and vertebrates to terrestrial life up to the origin of mammals. Unlike arthropods, vertebrates had to change ways of their locomotion and sensing while leaving water. Chapter 14. Dynasties of the land rulers: Succession and biogeography of plants, large herbivores, and predators during the whole Mesozoic. Triassic archosaurs expanded from equatorial regions to high latitudes while replacing synapsids. Chapter 15. Active flight: Origin and early evolution of flight of insects, pterosaurs, birds and bats. Small size is a derived character in all active fliers; both the earliest flying insects and vertebrates were of decimetre size. Chapter 16. Genesis of the paradise gardens: Origin and evolution of flowering plants, pollinating insects, and coeval higher vertebrates. Prolonged stability of Cretaceous and Tertiary environment was the basis of evolutionary recovery and progress. Chapter 17. Change from biological to social evolution: Evolution of primates, origin of humans and culture; unstable environment of their ancient and historic life. Sexual behavioural dimorphism as an adaptation to unstable environment triggered human evolution. Chapter 18. Historicism and laws of evolution: Review of methods of inference on the course of evolution and their basic assumptions. Ancestor-descendant hypotheses of relationships are falsifiable with application of evidence on fossils. Appendix. Linnaean classification of organisms: with brief diagnoses of taxa.