

c18 Index fossils are few < syn: guide fossil, hard parts >

CERCA TROVA — “Seek and you shall find.”¹

Bias in the fossil record exists because of the unequal circumstances in which the evidence of an organism can be preserved. Species with hard parts are abundantly represented by the fossilization of such. Without hard parts, an organism is wholly biodegradable except in certain anaerobic and/or mineralizing environments. Also, the distribution of species' members relates to their life style and the variety of species and the number of their individuals are only many for microscopic life.²

Index fossils (also known as *key fossils* or *type fossils*) are species of distinctive appearance that were readily preserved, abundant in all kinds of stratified rocks, worldwide in their distribution, and existed briefly. Fossils with similar attributes but of more local significance for the fine time-subdivision of strata, are called *guide fossils*. These “nuts and bolts” fossils for correlation of strata have proved to be relatively few. Their utility is enhanced by the fact that to use them little need be known of their biological nature. Famous examples are: Robert Hooke’s “snake stones” (**Figure c18.1**) and microscopic fossils of extinct conodonts. Index fossils for different times in the past belong to a very few groups (**Figure c23.1**) that, for practical reasons, are also the most studied.

North American Index Fossils, 1909,³ by Amadeus William Grabau (1870-1946) & Hervey Woodburn Shimer (1872-1965) began a tradition (each genus is described and illustrated and its age range is given) that continues in the multi-vol. *Treatise on Invertebrate Paleontology*, 1953-.⁴ □

Figure c18.1⁵ (illustration after Robert Hooke)

A comparison of modern nautilus (shown in sectional view) and the snake stones (extinct ammonites—three shown); persuaded Hooke in 1669) that they were “the Shells of certain Shel-fishes [*sic*], which, either by some Deluge, Inundation, earthquake, or some such other means, came to be thrown to that place, and there to be fill'd with some kind of Mud or Clay, or petrifying Water, or some other substance ...” The meaning of snake stones for Hooke’s contemporaries was that ammonites were petrifications of curled-up snakes that had died in rock crevasses. Hooke was prophetic in 1703 when he wrote of the snake (serpent) stones: “These shells are the greatest and most lasting monuments of antiquity, which in all probability, will far antedate all the most ancient monuments of the world, even the pyramids, obelisks, mummys [*sic*], heiroglyphicks [*sic*], and coins ... Nor will there be wanting media or criteria of chronology which may give us some account even of the time when [they formed].”⁵ Note: Prehistory for Hooke was pre-Adamite time and not deep time in the modern sense.



A galvanizing moment for fossils as records of geohistory was in 1784 when Tyler’s Foundation in Haarlem, Holland, set the prize question: “How far can one infer—on indisputable principles, from the known character of fossils, from the beds in which they are found, and from what is known of the past and present condition of the earth’s surface—what changes or general revolutions the surface of the globe has undergone; and how many ages must have since elapsed?”⁶ *On the general revolutions of the earth’s surface, and on the age of our globe*, 1787, by François-Xavier Burtin (1743-1818) was the winning essay.⁷

Footnote c19.1 “Whin” is a hard, fine grained, black rock (as is dolerite). “Sill” was what North of England quarrymen called any horizontal slab of rock and the intrusive nature of Great Whin Sill provided geological understanding of the origin of sills. However, this tabular intrusive body is only locally concordant to the bedding in the strata of limestone, sandstone and shale that it intrudes.¹