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FOSSILS: What they mean and how to collect them

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A common type of inquiry received by public agencies in this and other states pertains to fossils or objects thought to be fossils. The practical use of fossils has been explained in this publication (see *Mineral Information Service*, vol. 5, no. 6, pp. 1-3, June 1, 1952). The following information supplements the earlier article, which stressed the practical uses of fossils, by adding a short history of the science of paleontology, by bringing out some of the problems and values of the science as a vocation or avocation, and by pointing out some of the cultural and aesthetic aspects of the study of fossils.

What Are Fossils?

As defined by the noted geologist Amadeus W. Grabau, "Fossils are the remains of animals and plants, or the direct evidence of their former existence, which have been preserved in the rocks of the earth's crust."

Examples of fossil remains can easily be found. Fossils are common in decorative interior limestone, such material having been quarried from deposits of altered limestone which was originally deposited on the ocean floor. Most residents of California have heard of La Brea Pits. Here, large quantities of bones of Pleistocene animals are preserved in asphalt. Many of these bones have been dug out of the pits, cleaned, assembled, mounted as complete skeletons, and put on display in the Los Angeles County Museum. Fossil mollusks (clams and snails) are fairly abundant in rocks deposited in ocean basins which formerly covered large areas of California. Commonly, such deposits contain beds of pebbles and other features which can easily be identified with features one sees along a modern beach. Indeed, many shells similar to those seen scattered about on the present beaches or pulled up on anchors will, in the geologically near future, become fossils.

Some incorrect guesses

Men have always tended to explain the unknown in terms of their own beliefs and prejudices. Herodotus (484?-425 B.C.) was among the first whose written reflections on the origin of fossils are available to us. Aristotle (384-322 B.C.) believed that fossils were organic but that they originated in the rocks. Throughout the Middle Ages the remains of such Pleistocene mammals as cave bears and mammoths were believed to be those of giants, dragons, basilisks, or unicorns. Even in the Renaissance, Voltaire argued that fossil shells were either left by the evaporation in dry seasons of freshwater lakes and rivers or resulted from a superabundance of land snails which multiplied

Generally, workers in the field of paleontology do not include human relics or other evidence of former human activity within the meaning of the term "fossil". If such material is to have real significance, however, its recovery and preservation requires the same care as fossil material. State and Federal laws provide against unsystematic (destructive) collecting of such material. (For example, California State Penal Code, section 622.5 and the Federal "Antiquities" Act.)

during wet seasons. If the fossil shells could be shown to be of marine types he explained that they had been dropped from the hats of pilgrims on their way from the Holy Land to their homes, or that the shells had been lost from museums or private collections. If the rock around the fossil was so hard that neither of the above explanations would fit he decided that they were not shells at all, but merely shell-like forms, produced by some occult process of nature in the bowels of the earth. In the early 1700's much effort was expended trying to find the men and animals that had perished in the Biblical flood. In 1857, Hugh Miller, a Scottish geologist whose writing and lectures were then popular, wrote, "A century has not yet gone by since all the organic remains on which the science of Paleontology is now founded were regarded as the wrecks of a universal deluge..."

The study of fossils

As Hugh Miller implied, paleontology is the study of the life of the past. From the times of the ancient Greeks, Herodotus and Aristotle, to those of later observers such as Leonardo da Vinci (1451-1519) and Nicholas Steno (1631-1687), gifted individuals understood the nature and significance of fossil bones and shells. The intellectual environment, however, was not favorable to the acceptance of such ideas until the middle 1700's when the work of such men as the great Swedish naturalist Lin-

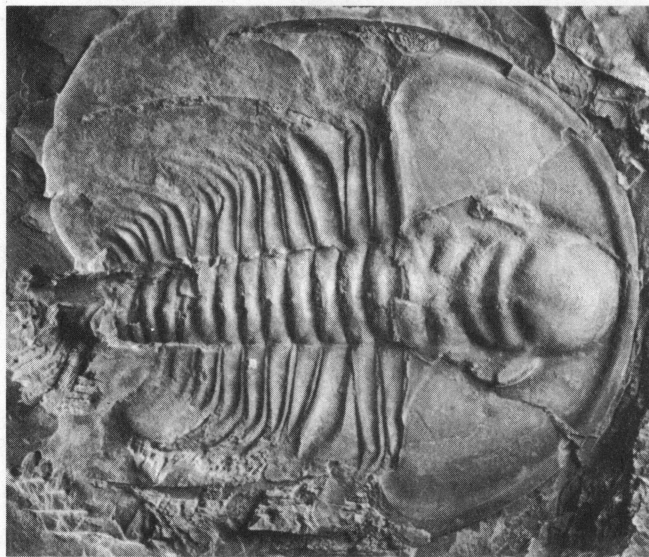


Figure 1. *Olenellus fremonti* Walcott, a Lower Cambrian trilobite. This specimen was found at the south end of the Marble Mountains, San Bernardino County (see figure 3). Photo courtesy of U.C.L.A. Department of Geology, by Takeo Susuki.