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GEOLOGY: THE FOUR-DIMENSIONAL SCIENCE

Satan, placed in the world to confuse all mortals. To others, such as Avicenna (A.D. 980–1037), the Arab philosopher responsible for the revival of interest in the works of Aristotle, they were inorganic petrifications that grew within the rocks as a result of the workings of a creative force, the *vis plastica*. Only by chance did they come to resemble bones or shells of living creatures. That ignorance extended to the discovery of the remains of prehistoric people, such as the Cro-Magnons and Neanderthalers, whose bones were sometimes carted to the village churchyard for a proper interment.

It remained for a singularly devoted, untutored, and eminently practical canal-builder, William Smith (1769–1839) to establish the existence of a relationship between stratified rocks and the fossils they contain. Fortunately for him, and for us, he lived and worked at the right time and place—during the period when canal building was active in England. The advent of the Industrial Revolution, coupled with the post-Napoleonic prosperity of Britain, placed a premium on the construction of such relatively cheap and modestly efficient trans-

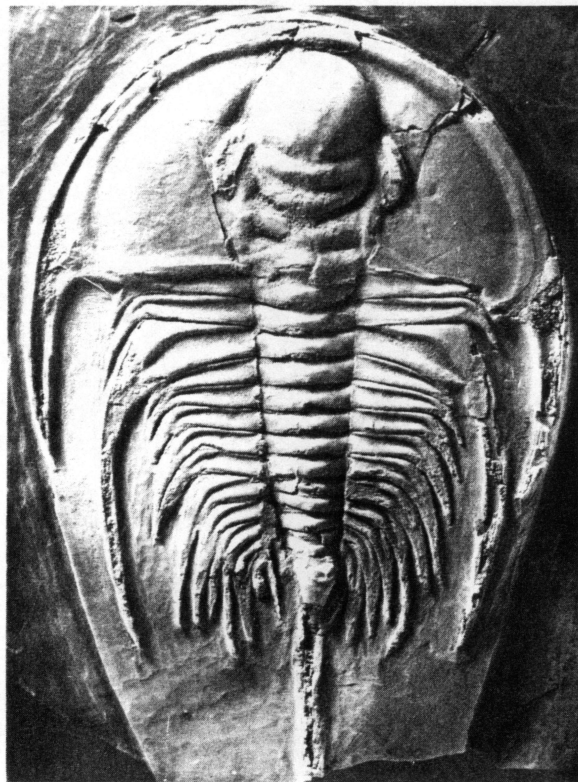
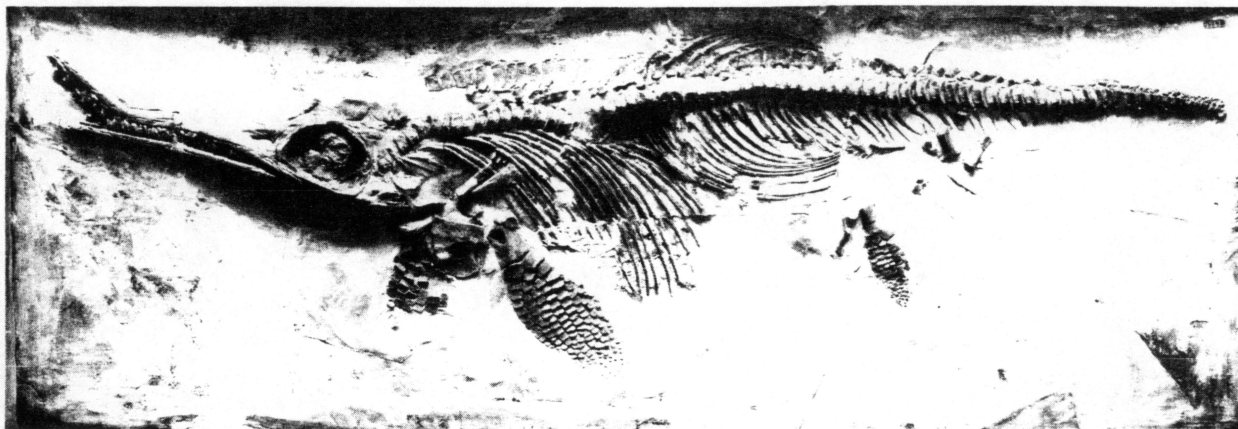


Fig. 1-10. *Olenellus fremonti*, a trilobite from the Marble Mountains, California. Its length is about 11.5 cm (4.5 in.). This animal, related to the hermit crab, lived in the oceans between about 600 and 225 million years ago; then disappeared from the face of the earth. Takeo Susuki

Fig. 1-11. Skeleton of *Ichthyosaurus*, a reptile that swam the seas about 175 million years ago. The modern porpoise resembles it somewhat in form. With a large mouth full of sharp teeth, an ichthyosaur no doubt presented a formidable appearance as it hunted in the ancient seas. Smithsonian Institution



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