fossils give information, and, with a single doubtful exception, of the Ammonites; and, among other Mollusks, of the genera Exogyra, Diceras, Requienia, Hippurites, Radiolites, Pterinea, Inoceramus, and others. Part of the change had been accomplished before the time of the catastrophe, for decline had made much progress in the Cycads, Ammonites, Belemnites, and in the Reptilian tribes. But still the destruction was great, world-wide, one of the most marvelous events in geological history. Among the larger land animals the species most likely to have escaped extermination are the Mammals; for many of them had no doubt already accustomed themselves to the higher lands or ridges of the continents, and their covering of fur would have made adaptation to a colder climate easy. The Birds also would have been to a large extent tenants of the interior and denser forests of the continent of the time. The Pterosaurs might have had, perhaps, an equal chance with the Birds, but for the absence of a coat of feathers.

As to the cause of the epochal disappearance of species, the remarks on the like event after the Appalachian revolution, on page 735, apply also here.

The Laramide orogenic disturbance in America passed with no marked contemporary movements in Europe, none sufficient to account for the thoroughness of the disappearance of species. Change by modification had its marked effects, for it has always been in progress; but extermination must have been the more prominent method of bringing about the great result.

Causes of extermination. — Since the destructions were to a very large extent marine, the oceanic circulation was probably one means of destruction. The world, by the end of the Cretaceous period, had become more diversified than ever before in its zones of temperature. The emergence from the ocean of a third of North America had taken place, and probably of as much of South America, and of large portions also of the other continents, and this would have determined some lowering of the earth's mean temperature, cooling both the air and oceanic waters. The cooling, during the Cretaceous period, it is certain, was great enough to drive Cycads from the Arctic regions to latitudes that are now at the middle of the Temperate Zone. If the change had made the Arctic waters only 15° F. colder than they were during the Cretaceous period, the polar waters, as they flowed southward, would probably have been exterminating to the greater part of the life of coast regions along the shallower waters, and down to such depths as the cold current reached. Such a cause might make a complete break in the succession of species in a region, without any break in the succession of beds, as happened in New Jersey (page 821). Its action would have been least on the western coast of North America, because of the shallowness of Bering Strait. Moreover, under these circumstances temperature would have worked similarly over the land, forcing Cycads southward, and putting unfavorable conditions into the old haunts of Reptile life.

The other most probable cause of destruction to life is that from earthquake waves. The making of a mountain system along the whole length of