

group that is represented among, and make, modern coral reefs. Even the old straight Nautiloid, the Orthoceras, had its later species.

The Insects lost, as has been said, a Paleozoic feature at this time; but the tribes are still the same as before in their more fundamental characters. Fishes, although their period of culmination had passed, still continued under the tribes of Ganoids and Dipnoans. Amphibians and Reptiles held on, and the latter became the ruling life of Mesozoic time. So it was with the greater part of the tribes of the Paleozoic. There was no break in the stream of life, but for the most part only seeming interruptions; and many of these owe their prominence in geological history to the culminations and declines of types that were in progress.

But it was an epoch of relatively abrupt change; and if chiefly due to the progressive evolution of new species, as has been urged by some geologists, there must have been for the result a great acceleration in such changes in consequence of the physical conditions produced by the orogenic disturbance. But the orogenic movements were local, and the biologically transforming effects from such a cause should have been confined to the countries where these movements were in progress. The universality and abruptness of the disappearances cannot therefore be so explained. Very much is left for the destructive effects, direct and indirect, that is, the *exterminations* attending the mountain-making.

The causes of the exterminations suggested by the changes are two. (1) A colder climate over the land, and colder waters in the extra-tropical oceans; for the emergence of the eastern semi-continent of North America and of large lands in the other continents could not fail to lower somewhat the temperature of the whole globe. With a lower temperature, the currents from the north sweeping along the coasts would have been destructive to the marine species living in the waters. (2) Earthquake waves produced by orogenic movements. If North America from the west of the Carolinas to the Mississippi valley can be shaken in consequence of a little slip along a fracture in times of perfect quiet, and ruin mark its movements, incalculable violence and great surgings of the ocean should have occurred and been often repeated during the progress of flexures, miles in height and space, and slips along newly opened fractures that kept up their interrupted progress through thousands of feet of displacement. The Acadian upturning took place on the ocean's border; and the Appalachian was not far distant from it. Arkansas, moreover, added to the extent of the belt of disturbance. Under such circumstances the devastation of the sea border and the low-lying land of the period, the destruction of their animals and plants, would have been a sure result. The survivors within a long distance of the coast-line would have been few. The same waves would have swept over European land and seas, and there found coadjutors for new strife in earthquake waves of European origin. These times of catastrophe may have continued in America through half of the following Triassic period; for fully two thirds of the Triassic period are unrepresented by rocks and fossils on the Atlantic border.